

# RADIO & TELEVISION NEWS



ROUND-THE-WORLD VOICE RADIO SYSTEM

PAGE 34

THE QUALITY OF RCA TUBES IS UNQUESTIONED



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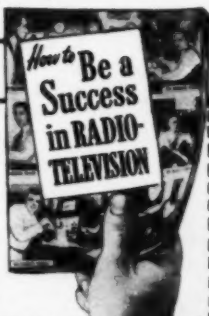
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**RADIO & TELEVISION NEWS**

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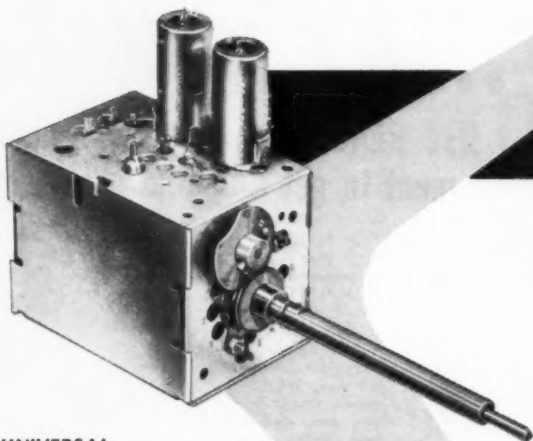
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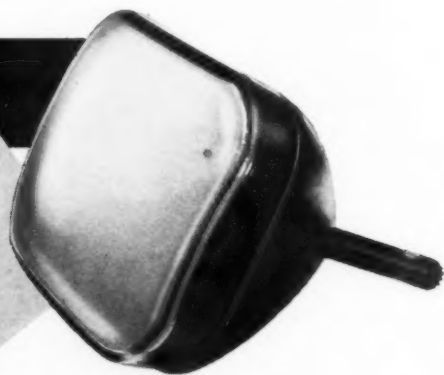
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# Service Clinic!

Engineering information to help you better service Raytheon

1. The Horizontal Oscillator used in a television receiver provides the left-to-right scanning excitation. This excitation must always be in perfect phase synchronization with the horz. scan of the television station's camera.

2. The Stabilized Horizontal Multivibrator oscillator, shown in Fig. 1, uses a stabilizing memory circuit (L23 & C107) to prevent line-by-line displacement of the picture (tearing) as a result of any interfering noise appearing along with the horz. sync.

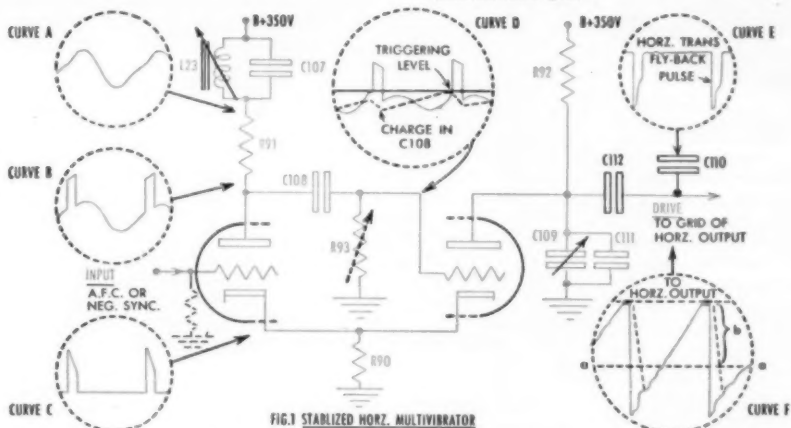


FIG. 1 STABILIZED HORIZ. MULTIVIBRATOR

3. The Circuit shown above is a cathode-coupled stabilized horizontal multivibrator that uses a 6SN7 duo-triode tube. During the period of scan, the first triode is conductive and the second triode is biased beyond  $I_p$  cut-off. When the triggering level is reached, as shown in Curve D, the second triode will start to conduct. A positive charge in C109 & C111 has been accumulating through R92 during the period of scan. This will be rapidly discharged by the plate conduction of the second triode.

The rapid discharge current through the cathode-coupling resistor R90 (Curve C) will cause the first triode to cut-off. This will excite oscillation (Curve A) in the stabilized resonator (L23 & C107) as well as producing an additive pulse across R91. (See Curve B.) This pulse will drive the grid of the second triode positive and grid current will flow so as to store a charge in C108. The increasing charge in C108 and the discharge of C109 & C111 will again cause the second triode to cut-off, thus the first triode will resume conduction for the duration of the next scan.

4. The Free-Running Frequency is determined by the resonance of L23 & C107 as well as the charge-holding time-constant of C108 & R93. L23 & R93 may serve as the horz. hold controls.

5. Synchronization may be A.F.C. or impulse sync. controlled. When impulse sync. is used, the first triode functions as a sync. amplifier and the sync. pulse triggers the second triode ahead of the free-running triggering level. When A.F.C. is used for sync., the first triode functions as a cathode follower that is cathode bias-coupled to the second triode and can change the freq. both faster or slower than the free-running frequency.

6. The Drive at the output is controlled by the combined capacitance of C111 and the drive adjustment trimmer C109. The discharge time of the drive (dotted line of Curve F) can be made steeper by the addition of a neg. pulse. (See Curve E.) This reduces horz. output tube loading of the high voltage fly-back pulse by reaching cut-off (dotted Line A) more rapidly within region "b."

7. Improved Circuitry such as this is one of many reasons why you can feel free to recommend Raytheon TV to a friend or customer.



Dependably Built for Dependable Performance



THE STARLIGHT—Model RC-1720

Belmont Radio Corp., 5921 W. Dickens Ave., Chicago 39, Ill.  
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August, 1951

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## For the RECORD.

• BY THE EDITOR

**A**S A direct observer of daily developments in the field of electronics, your editor has the privilege (in many cases) of studying the features and circuitry of many fine new products. In too many cases, however, he also runs into "horrible examples" of products, design, descriptive copy, and instruction books. It becomes his prerogative, as a human with normal, though sometimes taxed, temperament to do the proverbial "burn" and to give vent to his feelings!

Let's take, for example, an average auto radio. It is priced as high as \$110 by some auto dealers, yet these sets do not include a single refinement (electrical or mechanical) made since the introduction of the permeability tuner. It was many years ago that we hailed the local tube and its retaining socket. These, we were told, would greatly improve the auto set and prevent tubes from shaking loose from their sockets. Vibrators, too, would be secure and stay where they should be. Another "feature" (?) that brings tears to the eyes of the technician is the auto receiver chassis mounted in an upside down position. That is, the tubes are mounted toward the bottom in an inverted position with vent holes located in the bottom of the case. The manufacturers have obviously forgotten that heat rises! As it is now, the heat rising from the metal tubes can easily melt the wax in the tubular condensers. By locating vent holes in the bottom of the case, they have managed to insure an even and widespread distribution of melted wax all over the floor mat of the car. We held on to the hope, and we still do while gathering grey hairs, that some smart auto radio engineer would look at the specs of some military or aviation gear and discover that the local sockets and tubes have been in use for a long, long time. Perhaps the most "horrible example" in most auto sets is the basic construction of "the thing." Many manufacturers apparently have not been told that vacuum tubes do eventually burn out and need replacement, that vibrator contacts take a terrific beating and will not last forever, and that it would be considerate of the poor (many of them literally) service technicians to employ some common sense engineering in the design of their products.

For example: Mrs. Hotrod goes to the big city in her brand new \$4,500.00 1951 convertible and tunes in to see what's cooking with "John's Other Wife." She can guess—but, being a woman, wants to hear someone else admit it. Mrs. Hotrod crosses the railroad tracks at the outskirts of the city at the very moment that John dives out of the

window of Apt. 13—then silence. What a climax! Mrs. Hotrod doesn't realize that the tubes in her \$85.00 radio hang upside down and that the 6V6GT output tube had shaken loose and dropped from its socket (octal, that is). If her radio used a 7C5 (loctal equivalent) she would have heard John hit bottom. While in town, an auto radio technician begins the tedious job of removing the dash panel trim to get at the retaining bolts holding the auto set. He suspects a tube failure and so states to his customer. Mrs. Hotrod asks, "Do you have to take my car apart just to test the tubes?" Embarrassed, and cursing the radio manufacturer, the technician replies, "Yes, Mam, and I must then pull out the set, place it on my test bench, remove nine stubborn self-tapping screws to remove a tin lid cover. All this just to get at the tubes. If they all test okay and the trouble is under the chassis—then I must remove the other lid by the same stupid process. If one of the buffer resistors under the vibrator is open I will have to heat the hunk of tin with a hot iron to remove another lid in order to reach the components. You see, Madam, the manufacturer of this particular set apparently doesn't give a damn (pardon) how long you or I are tied up in order to fix your radio—no matter how simple the failure.

"In order to make a living I must charge a regular service fee for my service—even though it was just this output tube, which is okay, falling out of its socket as a result of impractical engineering, and a 'pinch penny' technique of using surplus sockets and tubes in an application demanding locals or some form of tube retainers. And, while I'm in a nasty mood, Mrs. Hotrod, may I point out that it's about time that many radio set makers—television too—consider the problems of maintenance when designing equipment. To be specific—take this set of yours as an example. This is 1951, not 1937, and a well engineered and practical auto radio would include the following:

1. Locals or miniature tubes with shields to secure the pins in their sockets and, incidentally, a more compact unit as a result.

2. A hinged or removable drop type lid or section held by wing nuts, that would readily expose all tubes.

3. The design of trimmers that are accessible for tuning while the set is mounted in the automobile. Circuits are often thrown out of alignment as mounting bolts are tightened during installation."

The above incident is fictitious to some extent. It does, we are sure, exemplify what must transpire in the minds of the auto radio technician and his customers. . . . . O.R.

**RADIO & TELEVISION NEWS**

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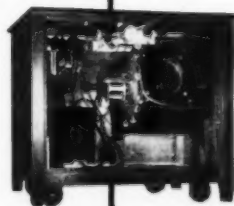
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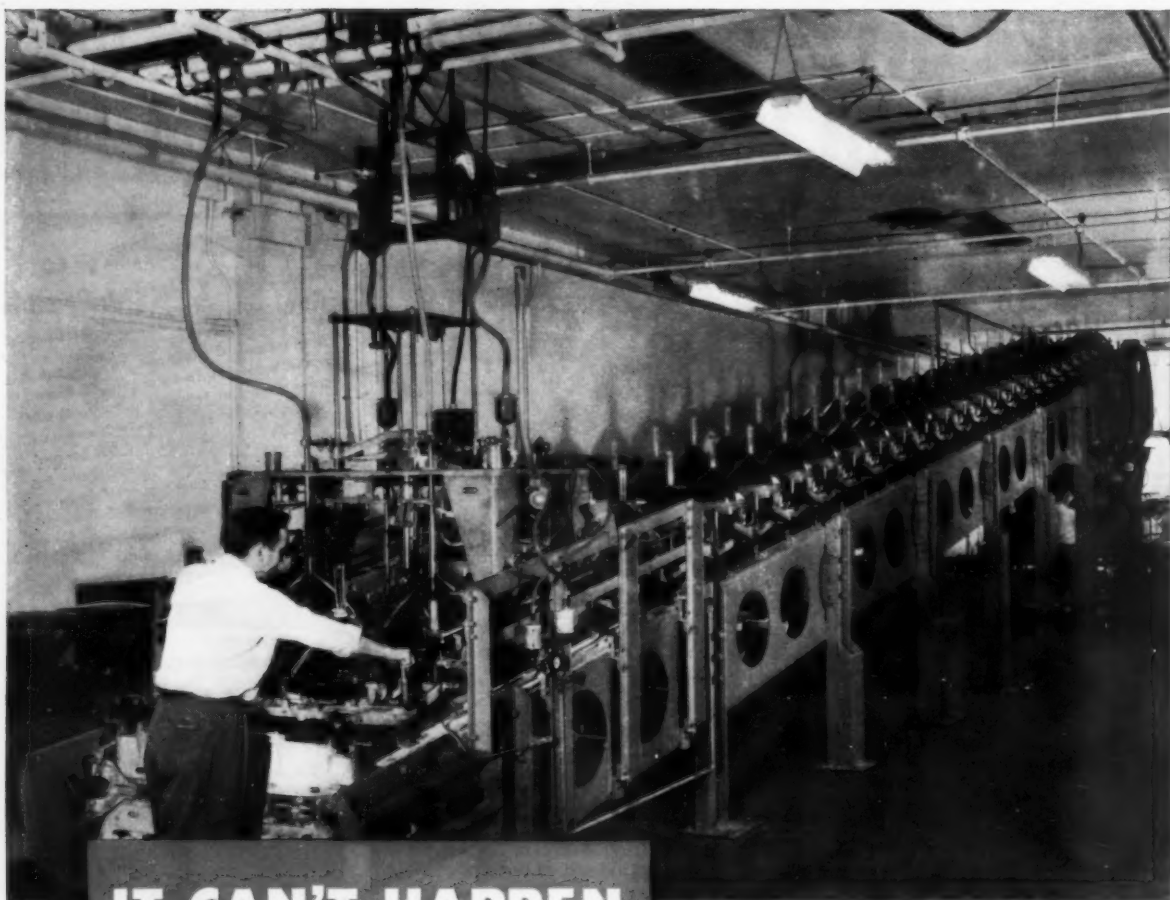
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Name.....

Address.....

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Another engineering first for you! Hytron's unique, automatic machine for dispensing and settling the screens of TV picture tubes.

What does it mean to you? A guarantee of the most uniform and finest-textured TV screens in the business. No light screens. No heavy screens. No specks from foreign particles. No unevenness.

Automatic dispenser pours exactly the right amount of chemicals into the big bottles as they travel slowly up the ramp. Conveyor's motion is so smooth a nickel standing on edge can ride it! Phosphors fall uniformly out of suspending solution... undisturbed — a "must" for perfect screens. Decanting or pouring off of chemical residue, loading, and unloading are equally shock-free. And there's precise electro-mechanical control throughout... with human errors barred!

That is why you can pick *any* Hytron picture tube. Depend on it. Any one will give you the finest screen money can buy. Yes, it pays to buy from Hytron... the most modern picture-tube plant in the world.



MAIN OFFICE: SALEM, MASSACHUSETTS

**HYTRON  
EASY BUDGET  
PLAN**



The easy way to sell picture tubes. No need to miss that profitable picture tube sale — just because your customer doesn't have the cash. Get the details on this original Hytron service for you.

**Fill out and mail this coupon today!**

Please rush me details on the Hytron Easy Budget Plan.

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**RADIO & TELEVISION NEWS**



# GET INTO RADIO-TELEVISION

## ELECTRONICS By Shop-Method Home Training

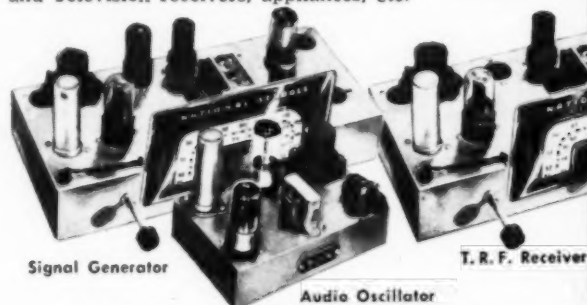
### GOOD JOBS AWAIT THE TRAINED RADIO-TV TECHNICIAN

There is a place for you in the great Radio-Television-Electronics industry when you are trained as National Schools will train you at home!

Trained technicians are in growing demand at good pay—in manufacturing, broadcasting, television, communications, radar, research laboratories, home Radio-TV service, and other branches of the field. National Schools Master Shop-Method Home Training, with newly added lessons and equipment, trains you in your spare time, right in your own home, for these fascinating opportunities. OUR METHOD IS PROVED BY THE SUCCESS OF NATIONAL SCHOOLS TRAINED MEN, ALL OVER THE WORLD, SINCE 1905.

### EARN WHILE YOU LEARN

Many National students pay for all or part of their training with spare time earnings. We'll show you how you can do the same! Early in your training, you receive "Spare-time Work" Lessons which will enable you to earn extra money servicing neighbors' and friends' Radio and Television receivers, appliances, etc.



Signal Generator

Audio Oscillator

T. R. F. Receiver

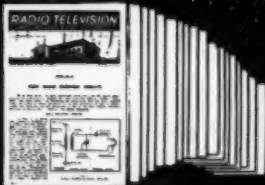
### National Schools Training Is All-Embracing

National Schools prepares you for your choice of many job opportunities. Thousands of home, portable, and auto radios are being sold daily—more than ever before. Television is sweeping the country, too. Co-axial cables now under construction will soon bring Television to every city, town, and farm! National Schools' complete training program qualifies you in all fields. Read this partial list of opportunities for trained technicians:

Business of Your Own • Broadcasting  
Radio Manufacturing, Sales, Service • Telecasting  
Television Manufacturing, Sales, Service  
Laboratories: Installation, Maintenance of Electronic Equipment  
Electrolysis, Call Systems  
Garages: Auto Radio Sales, Service  
Sound Systems and Telephone Companies, Engineering Firms  
Theatre Sound Systems, Police Radio  
And scores of other good jobs in many related fields.

### TELEVISION TRAINING

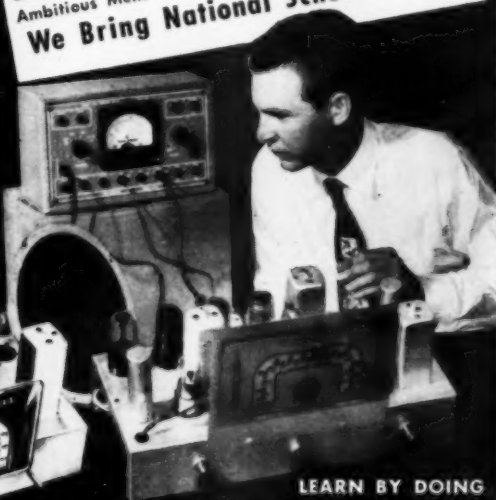
A complete series of up-to-the-minute Television lessons is an important part of your course. They cover all phases of Television repairing, servicing and construction. The same lesson texts used by resident students in our own modern and complete Television broadcast studios, laboratories and classrooms!



## MASTER ALL PHASES!

Get Master Shop-Method Home Training from an Established Practical Resident School with its own Training Shops, Laboratories, and Studios—and almost 50 Years of Successful Experience in Training Ambitious Men.

We Bring National Schools To You



### LEARN BY DOING

You receive and keep all the modern equipment shown above, including tubes and valuable, professional quality Multitester. No extra charges. You build the fine Superheterodyne Receiver with parts we send you.

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These 2 Free Books give you all the facts. Send today for National Schools' new, illustrated Book of Opportunity in Radio-Television-

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Send me your FREE book "Your Future in Radio" and the sample lesson of your course. I understand no salesman will call on me.

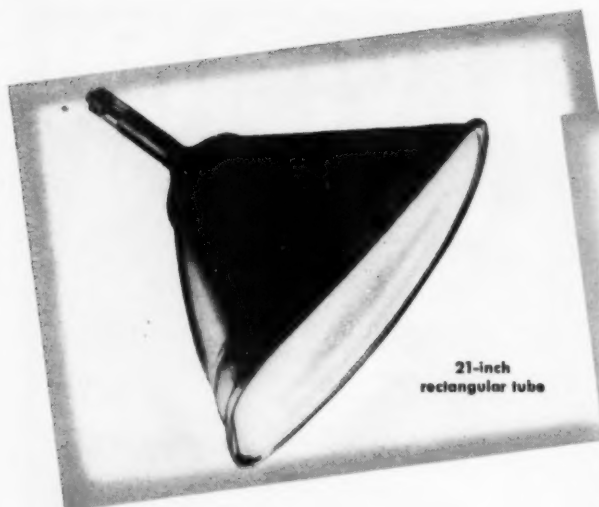
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☐ Check here if Veteran of World War II



21-inch  
rectangular tube



24-inch  
round tube

# BIGGER PICTURE TUBES

## *of U·S·S Stainless Steel*

### are television's big news today



30-inch  
round tube

● Here's a display of big-tube television that any dealer could be proud of. And a big assist in the development of today's large-screen television goes to U·S·S Stainless Steel—U·S·S 17-TV.

The use of U·S·S 17-TV Stainless Steel in picture tube shells cuts tube manufacturing costs. Such metal-glass tubes are also stronger and thus safer, less susceptible to implosion. And this special grade of Stainless Steel makes it possible to keep these giant tubes light and compact. With lighter steel shells, considerable time is saved handling tubes on the production line.

Specifically, these Stainless Steel shells reduce tube weights by one-fourth to one-third—highly important in the 21, 24 and 30-inch picture tube range.

Since the face plate is made separately from the shell in metal-glass TV tubes, it can be made from drawn glass having better optical qualities. The clear, sharp pictures that result are in keeping with their "theater-screen" size.

U·S·S 17-TV Stainless Steel—developed especially for television applications—has proved itself the strongest, lightest and safest material for both rectangular and round tubes. These big, new sets . . . the kind of television your customers want . . . deserve your best sales efforts.

AMERICAN STEEL & WIRE COMPANY, CLEVELAND • COLUMBIA STEEL COMPANY, SAN FRANCISCO

NATIONAL TUBE COMPANY, PITTSBURGH • TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM • UNITED STATES STEEL COMPANY, PITTSBURGH

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## U·S·S STAINLESS STEEL

SHEETS • STRIP • PLATES • BARS • BILLETS • PIPE • TUBES • WIRE • SPECIAL SECTIONS

1-589

UNITED STATES STEEL

# 2 New Trio Products

## TRIO TV ROTATOR AND DIRECTION INDICATOR

### TWO HEAVY DUTY MOTORS For Trouble-free • Two Direction Rotation

Here's the rotator that provides the ultimate in trouble-free dependable operation. Designed to support the heaviest TV arrays — even in 80 M.P.H. winds! This outstanding rotator has undergone extensive tests for three years, standing up under every abuse and temperature extremes.

Here, indeed, is the rotator that abolishes TV callback problems!

#### Two Heavy Duty Motors

Two 24 volt motors are used — one for clockwise and one for counter-clockwise rotation. Even if children play with the unit and leave it on continuously, a motor cannot burn out since load on a single motor is never on more than 50% of the time!

Positive acting electrical stops at both ends of 360° turn eliminates lead damage.



Indicator always shows exact antenna position.

#### Compare These Features

- Cast TENSALLOY aluminum mast holder withstands 4500 lbs. bending movement.
- 11/16 steel shaft withstands 4500 lbs. bending movement
- Automatic Electro-Mechanical Brake — reduces coasting to minimum
- Can be fastened to any pipe up to 2" OD
- Two direction rotation
- All-aluminum case — no cast zinc!
- Numbered terminal boards on rotator and indicator
- Turns 1 RPM, lifetime lubricated
- Ball-bearing end thrusts on shafts
- Ideal for 10, 6 and 2 meter amateur use

## NEW TRIO *All Aluminum* TOWER

Weighing less than a pound per foot, this sturdy, extremely handsome, all weather-proof triangular tower represents a great refinement in streamlined appearance and installation ease over all others. Its all-aluminum components permit the most flexible arrangements for construction of the exact tower needed for any installation.

Tower may be raised from horizontal position in heights up to 40 feet. For additional height, sections may be added from bottom.

Comes in 5 foot sections, a bottom section, a top section and as many center sections as desired.

#### FEATURES

- Sturdy, Yet Light In Weight — Less Than A Pound Per Foot
- Forever Rust Proof
- High Quality Extruded Aluminum
- Interchangeable Sections
- Preferred Riveted Construction . . . No Welded Joints
- Dual Swivel Base — 180° and 360° permits vertical or horizontal plane mounting
- Low Installation Cost
- Completely Cartoned For Protection In Shipping — Compact Storage



Dual Swivel Base  
180° and 360°

# THOMPSON CORPORATION

AFFILIATED WITH TRIO MANUFACTURING CO.  
GRIGGSVILLE, ILLINOIS

## TRIO YAGIS

*Lead the Field . . .*

### TRIO DOUBLE FOLDED DIPOLE

(Model 304)



Here is the popular TRIO Double Dipole TV Antenna. With 10 db forward gain and a front-to-back ratio of 85 db, it is unexcelled for extreme fringe areas. Available for each of 12 TV channels. Easily stacked for additional gain. Reinforced fittings for extra strength — extra rigidity!

- Exact Impedance Match To 300 ohm Line!
- Sturdy Construction — Light Weight!
- Partially Assembled!

### TRIO 2-CHANNEL YAGIS

(Models 445 & 479)



Rapidly becoming the most popular — most wanted TV antenna in America. Available for channels 4 and 5, and channels 7 and 9. Provides gain on two channels equal to any two conventional 4-element yagis!

- Full 10 db Gain On 2 Channels!
- Less Weight Per Gain Than Any Other TV Antenna!

### TRIO PHASITRON

Now available separately

(Model No. PC-600)



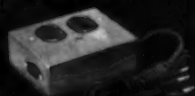
The TRIO PHASITRON, originally sold only as part of the TRIO Controlled Pattern TV Antenna System, is now available separately for TV set owners who want to get the very best results from their sets and antennas, or to hams and other experimenters.

PHASITRON acts as a continuously variable tuning stub and will provide an exact impedance match between line and booster and helpful in matching output impedance of booster to set input impedance. Due to exact matching, losses in line become negligible and set performance greatly improved.

May also be used to coordinate input from two or more antennas to provide added balanced output to set. Write for full details.

### NEW TRIO TV ACCESSORY CONTROL UNIT

(Model No. RY-1)



A handy control unit that hides away inside or in back of the TV set and provides an automatic line switch for booster, rotator, TV lamp or other accessories. By plugging the line cords from these accessories into the TRIO Control Relay Unit, all accessories are turned on with the one switch controlling the TV set. Quickly installed without making any wiring changes in set.



*Trio* MFG. CO.

GRIGGSVILLE, ILLINOIS

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FROM SOLDIERS IN KOREA

# KOREA!

## hallicrafters S-72

### LONG RANGE PORTABLE

The World's Most Powerful Portable

Servicemen the world over are recording a new chapter in performance for Hallicrafters famous S-72. This 8-tube masterpiece of precision engineering features the widest frequency range of any portable made—with *continuous coverage* from 540 kc to 30 Mc.\*

PRICE: \$109<sup>95</sup> Less batteries. AC/DC or batteries; brown leatherette cabinet. 61-in. whip antenna for short wave; loop for long wave.

\*S-72L, for aircraft and marine band reception, \$119<sup>95</sup>, 175-920 kc plus 540-12.5 Mc.

# hallicrafters

"The Radio Man's Radio"

WORLD'S LEADING MANUFACTURER OF PRECISION RADIO & TELEVISION • CHICAGO 24, ILL.  
RADIO & TELEVISION NEWS

AMIDONG, KOREA—22 March, 1951:  
"... S-72 performed better than expected. We can hear the news each day instead of waiting for the news papers. The radio will pick up Japan easily on standard broadcast or short wave, and on the latter you can get Australia (even in the daytime) Manila, Honolulu, and San Francisco."

KOREA—38th Parallel—3 April, 1951:  
"... my S-72 is performing very well. I receive standard broadcast very good at night. I have been able to pick up London and San Francisco's news on that wave."

c/o Fleet Post Office,  
San Francisco, California, 1-2 April, 1951:  
"... in central Korea, S-72 operates well regardless of location"



# CRT TESTER AND CIRCUIT ANALYZER

CHECKS CRT & CRT CIRCUIT IN TV SET

## DISTRIBUTORS

**ALABAMA**  
Forbes Distributing Co., Birmingham  
Helson Radio & Supply Co., Inc., Mobile  
Reid Distributors Co., Birmingham

**CALIFORNIA**  
Arrowhead Radio Supply, San Bernardino  
Kierulff & Co., Los Angeles  
Radio Parts Sales Co., Los Angeles  
Silverdale Radio Supply, San Diego

**CONNECTICUT**  
Bond Radio Supply Inc., Waterbury  
Harty & Young, Hartford  
Harty & Young, New Haven  
Harty & Young, Bridgeport  
Moses Radio Electronics Co., Hartford  
Stamford Radio Supply, Stamford

**DELAWARE**  
Almo Radio, Wilmington  
**DISTRICT OF COLUMBIA**  
Kenyon Radio Supply Co., Washington  
**FLORIDA**  
Electric Supply Co., Inc., Tampa  
Herman Radio Supply Co., Miami  
Runkado Radio Supply, Jacksonville  
Radio Parts Inc., Miami  
Welch Radio Supply, St. Petersburg

**GEORGIA**  
Peaslee-Gault Corp., Atlanta  
Southeast Radio Parts Co., Atlanta  
Specialty Distributing Co., Atlanta

**ILLINOIS**  
Allied Radio Corp., Chicago  
Concord Radio Corp., Chicago  
Lukko Sales Corp., Chicago  
Radio Parts Outlet, Chicago

**INDIANA**  
Associated Distributors, Indianapolis  
Radio Distributing Co., Indianapolis  
Radio Distributing Co., South Bend  
Terre Haute Radio, Terre Haute

**IOWA**  
Farnsworth Radio & Television, Waterloo  
Gifford-Brown, Cedar Rapids  
Radio Supply Co., Des Moines  
Ray-Mac Supply Co., Waterloo  
World Radio Labs, Council Bluffs

**KENTUCKY**  
P. I. Burks & Co., Louisville  
Kentucky Radio Supply Co., Lexington

**LOUISIANA**  
Pee Jay Radio Co., New Orleans  
Walther Bros. Co., Inc., New Orleans  
**LOUISIANA**  
Louisiana Radio & TV Distributors, Inc., Baton Rouge  
Henry O. Berman Co., Baltimore  
D & H Distributing Co., Inc., Baltimore  
Dealers Wholesale Radio, Salisbury  
Radio Electric Service Co., Baltimore

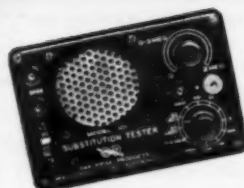
**MASSACHUSETTS**  
DeMambo Radio Supply Co., Boston  
DeMambo Radio Supply Co., Worcester  
Harty & Young, Lawrence  
Harty & Young, Boston  
Harty & Young, Springfield  
A. W. Mayer Co., Boston  
Melrose Sales Co., Melrose  
Radio Shack Corp., Boston

**MICHIGAN**  
Lifsey Distributing Co., Flint  
Radio Parts, Inc., Grand Rapids  
Radio Supply & Engineering Co., Inc., Detroit

**MINNESOTA**  
Beaman Co., Minneapolis  
E. G. Clinton Co., Minneapolis  
F. C. Hayer, Minneapolis  
Stark Radio Supply Co., Minneapolis

**MISSOURI**  
Burstein-Applebee, Kansas City  
Van Sickle Radio Co., St. Louis  
**NEW JERSEY**  
Allen-Hurley, Trenton  
Almo Radio, Atlantic City  
Continental Sales Co., Newark

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**OAK RIDGE**  
Portable "Miniature"  
**FIRST!**



### MODEL 101 SUBSTITUTION TESTER

Substitutes 5 paper and 2 electrolytic condensers, 4 resistors, potentiometer, loudspeaker and output transformer.

Size: 5 3/4 x 4 x 2 1/4"  
Dealers Net—\$17.95



### MODEL 104 SYNCHRO-SWEEP GENERATOR

Generates a combination of pulses and sawtooth waves for adjusting or tracing linearity, sync, sweep, and HV circuits. R. F. or mod. output.

Size: 5 3/4 x 4 x 2 1/4"  
Dealers Net—\$44.50



### MODEL 106 CRT TESTER

#### CHECKS:

- High Voltage Breakdown or Leakage
- Gas between elements in Electron Gun
- Gas between High Voltage Anode and Electron Gun
- Conductance between Cathode and Control Grid
- Conductance between Control Grid and Screen Grid
- Filament Continuity
- High Voltage on Anode
- Screen to Control Grid Voltage from set
- Control Grid to Cathode Voltage from set
- Brightness Control Voltage

Size: 5 1/2 x 3 1/4 x 2 1/4"  
Dealers Net—\$29.95



### MODEL 102 HIGH VOLTAGE METER

10,000 ohms per volt HV meter. D. C. voltages: 0-500V, 15KV, 30KV with 30KV insulated probe.

Size: 5 3/4 x 4 x 2 1/4"  
Dealers Net—\$17.95



### MODEL 103 SIGNAL GENERATOR

Generates a wide range of modulated or unmodulated precision R. F., I. F., and audio-video signals for signal tracing or aligning TV receivers. (54-216 m.c., 20-48 m.c., 4.5 m.c. and 500 cycles).

Size: 5 3/4 x 4 x 2 1/4"  
Dealers Net—\$33.50



### MODEL 105 20,000 OHM PER VOLT MULTIMETER

1% resistors throughout. 6 DC ranges: 0-2.5V-5KV; 6 AC ranges: 2.5V-5KV; 4 current ranges: 100UA-500 MA; 3 resistance ranges: 0-2000-20 meg. Easy to read 3 1/2" Multiscale meter. Size: 5 1/2 x 3 1/4 x 3" Dealers Net—\$38.95



### MODEL 107 DYNAMIC TYPE TUBE TESTER

Complete tube tester supplying plate, screen grid and filament voltages to check all receiving type tubes. 1A, 2A, 5, 6A, 12A, 18A, 25, 35, 50 and 117 V filaments.

Size: 5 1/2 x 3 1/4 x 2 1/4"  
Dealers Net—\$49.95

## DISTRIBUTORS

**Columbia Distributors, Inc., Columbia**  
Joe's Radio Shop, Bridgeton  
Rich-New Jersey Inc., Newark  
Mytelka & Rose, Inc., Newark  
Monmouth Radio Supply Co., Newark  
Nidco, Inc., Jersey City  
Radio Electric Service Co., Camden  
Radio Wire Television Co., Newark

**NEW YORK**  
Arrow Electronics Inc., N.Y.C.  
Chief Electronics, Poughkeepsie  
Fisher Distributing Co., Inc., N.Y.C.  
Ft. Orange Radio Distributing Co., Albany  
Green Radio Distributors, Brooklyn  
General Electronic Distributing Co., N.Y.C.  
Fred C. Harrison, Elmira  
Hunter Electronics, Rochester  
Island Radio Distributors, Hempstead, L.I.  
Lafayette Radio, N.Y.C.  
Melville Radio Corp., Flushing, L.I.

**MAINE**  
Melville Radio Corp., White Plains  
Midway Radio & TV Corp., N.Y.C.  
Norman Radio Distributors, Inc., Jamaica, N.Y.  
Radelco, Inc., N.Y. Vernon  
Radio Equipment Co., Buffalo  
Stan-Burn Radio & Electronics Co., Brooklyn  
Standard Parts Corp., Hempstead  
Westchester Electronics, White Plains

**NEW HAMPSHIRE**  
DeMambo Radio Supply Co., Manchester  
Evans Radio, Concord  
**NORTH CAROLINA**  
Dalton-Hege Radio Supply Co., Winston-Salem  
Dixie Radio Supply Co., Inc., Charlotte  
Johanneson Electric Co., Inc., Greensboro  
Meridian Electronic Equipment Co., Durham  
Shaw Distributing, Charlotte  
Southeastern Radio Supply Co., Greensboro

**OHIO**  
Chambers Electronics, Cincinnati  
General Electric Supply Corp., Cincinnati  
Nolub & Hogg Co., Cincinnati  
Hughes-Peters Inc., Dayton  
Hughes-Peters Inc., Columbus  
Lifetime Electronics, Toledo  
Morrison Radio Supply, Ashtabula  
Premier Radio Supply Co., Cleveland  
Srapco, Inc., Dayton  
G. W. Taylor, Cleveland  
Warren Radio, Toledo  
Whitehead Radio Co., Columbus  
Winteraco, Cleveland

**OKLAHOMA**  
Electronic Supply Co., Oklahoma City  
Electronic Supplies, Tulsa  
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A. C. Radio Supply Co., Philadelphia  
A. G. Radio Parts Co., Philadelphia  
Almo Radio Co., Philadelphia  
George D. Barber Co., Inc., Reading  
Barnett Bros. Radio Co., Philadelphia  
Barro Radio Co., McKeesport  
D. & H. Distributing Co., Harrisburg  
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Kratz Bros., Norristown  
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manufacturing division of Video Television, Inc.



# New 3rd Edition SPRAGUE TV CAPACITOR REPLACEMENT MANUAL



Here—just off press—is the NEW (3rd edition) of this famous Sprague manual with complete recommendations on critical capacitor replacements on 964 TV receivers. Don't guess! Don't waste time! Let the Sprague manual tell you in a jiffy exactly what replacement capacitor to use!

Get one FREE from your Sprague Distributor or send 10c direct to us using attached coupon.

**FREE!**

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Please rush a copy of your new TV Capacitor Replacement Manual M-473 I enclose 10c to cover handling and mailing.

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(This Manual can be obtained free from Sprague distributors)

**GET YOUR COPY... NOW!**

## Spot Radio News

★ Presenting latest information on the Radio Industry.

By RADIO & TELEVISION NEWS  
WASHINGTON EDITOR

**COLORVISION**, on a legal and technical rampage for nearly a decade, which it was felt might become quite a docile member of the arts with a popular decision from Washington, has now entered an even more raging stage, in view of the edict from the Supreme Court which favored the Commission's disc ruling, but still applauded the possibilities of compatibility, one of the basic technique factors around which much of the official arguments revolved.

The high court acknowledged that CBS had apparently made more rapid progress in developing an acceptable system, but added that their procedure has been attacked on the ground that it was . . . "utilizing old knowledge highly useful in the realm of the physical sciences and mechanical practices, but incongruous in the new fields of electronics occupied by television." Declaring that the latter fact was still a focal objection to the wheel approach, the justices added there was also the serious objection that . . . "existing receiving sets are not constructed in such a way that they can, without considerable adjustments, receive CBS color broadcasts, either in color or black and white." This problem, they said, makes the system . . . "incompatible with the millions of television receivers now in the hands of the public."

Noting that a compatible system . . . "would be more desirable" . . . the members of the high tribunal said that . . . "recognition of this fact seems to be the controlling reason why the Commission did not long ago approve the incompatible CBS system."

Supporting the Commission's reasons for giving the nod to CBS, the court said that the ether-lane cops believed that . . . "the CBS system will provide the public with color of good quality, and that television viewers should be given an opportunity to receive it, if they so desire." Such a view, the justices felt was fair, even though . . . "the wisdom of the decision can be contested, as is shown by the dissenting opinions of two Commissioners." However, it was pointed out that . . . "courts should not overrule an administrative decision, merely because they disagree with its wisdom." The implication, in this comment, that some of the justices might have questioned the practical virtues of the Commission's authorization of me-

chanical huecasting, has become a sizzling topic of debate in many industry circles.

In the decision, which was issued as a majority opinion, there appeared also a statement by Justice Frankfurter, expressing doubts as to the wisdom of legalizing an incompatible system. He intimated that the Commission might have acted too hastily. To his way of thinking, the fixing of standards could tend to eliminate the incentive for improvement.

The justices also appeared to feel that the go-ahead signal did not preclude any further development and cited the report of the FCC to justify this view, a report which declared that the Commission has not closed the door on any experimentation or possible examination of any practical procedure resulting from such study. FCC reemphasized this factor in a special public notice statement on color, stating that . . . "persons with genuine programs of experimentation in the color field may carry on their experiments by securing experimental authorization." And in a subsequent commentary, covering the possibility of a different color system being adopted in the near future, the Commission added that if a proponent reasonably satisfied a criterion, a hearing might be ordered to consider a petition to adopt such a new system: According to the criteria a system should . . . operate within the present band; be capable of producing a picture which has a high quality of fidelity, adequate definition, good picture definition, and is not marred by misregistration, line crawl, jitter, etc.; provide a picture which is sufficiently bright to permit adequate contrast range and which can be viewed under normal home conditions without objectionable flicker; be capable of operating through apparatus that is simple to operate in the home, with no critical registration or color controls, and be cheap enough to be available to the great mass of the public; be capable of operating through equipment at the station that is technically within the competence of the type of trained personnel hired by a station owner who does not have an extensive research or engineering staff at his disposal, while the costs of purchase and maintenance of the equipment must not be so high as to restrict the class of persons who can afford to

**RADIO & TELEVISION NEWS**



**CHICAGO, ILL.**—Harold W. Chambers, Chambers Radio and Appliance Co., says: "We had to lick call-backs before they licked us. So we made quality tubes a 'must' at Chambers—principally G-E tubes, the brand every serviceman respects. Now TV service shows a steady profit on our books. Consequently, all of us here are strong for General Electric tubes—boost them every chance we get."

**BROOKLYN, N. Y.**—Joseph F. Lauinger, President, Conlan Electric Company, says: "Call-backs can wipe out profits. Quality tubes mean fewer call-backs—protect income. That's why, with 40,000 owners on our contract list, we feature G-E tubes. We know that when one of our men installs a G-E picture tube or receiving type, chances are that customer will stay satisfied!"



## HERE'S PROOF THAT G-E TUBES CUT CALL-BACKS!

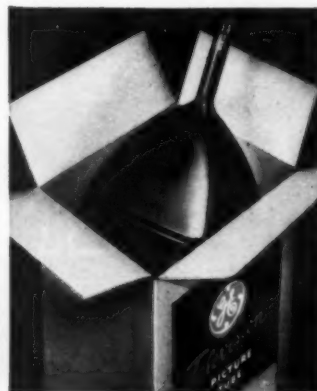
**CINCINNATI, O. - COVINGTON, KY.**—Everett Caudill, Manager, Tel-Rad Center, says: "To cut costs, we had to cut call-backs! They tied up our repairmen—wasted valuable working time. The trouble was mostly tube failures. We had to stop that in its tracks—and we did, by going over 100-percent to quality tubes. When we say 'quality tubes' at Tel-Rad Center, we mean, first of all, G-E tubes!"



**WASHINGTON, D. C.**—Mike Filderman, Vice-president, Phillips Radio Company, says: "Our call-back expense scared us, for customers' sets kept giving trouble. That was before we standardized on quality tubes—G-E tubes. They've done away with our most common cause of receiver trouble, tube failures. Believe me, that saves plenty, when you're servicing about 15,000 TV sets on yearly contract!"



Thousands of dealers, the country over, echo what these leading servicemen say about G-E tubes . . . For quality tubes to cut down YOUR call-backs, see your General Electric tube distributor today!



# GENERAL ELECTRIC

381-KAB



## STAY TUNED IN!

*Always*  
There's a **NEWS** Program  
from the **TELETOWER!**



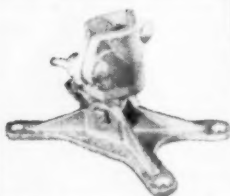
Teletower always has... does... and always will... place "high priority" upon development engineering. It was constant design study that pushed Teletower to top position in sales. *Continuing* design study will keep it "the tower in your future".

Penn's newest development is a "revolution"—a new self-supporting tower that carries two hundred and fifty pounds of head-load without using a single strand of guy wire! You'll be hearing plenty more about this one soon... from Penn... from dealers... from set owners.

Watch this publication for our advertising... and watch your mail for timely messages from Teletower.

### STAY TUNED IN... WITH TELETOWERS!

#### A FEW DEVELOPMENT ENGINEERING ACHIEVEMENTS OF JUST ONE YEAR!



**Pole Base Mount.**  
Durable aluminum base with adjustable socket to accommodate 1" O.D. tubing to 2" pipe. Competitively priced.



**Universal Motor Mount.**  
Easy to adapt to all antenna rotors.

**Built-In Base** permits raising tower on slope after base is fastened to roof.



# PENN

Teletowers  
Lift towers  
Mast  
Hardware

PENN BOILER & BURNER MFG. CORP., LANCASTER, PA.

operate a television station; be capable of transmitting color programs over intercity relay facilities presently in existence or which may be developed in the foreseeable future, and the system must not be susceptible to interference, as compared with the present black and white system.

**THE COURT ORDER** created a flurry of announcements from some accessory and set makers, particularly the recently CBS-acquired *Air King* company, who described color equipment which would soon be available and also demonstrated models at shows in Chicago and special trade meetings in New York City. Many chassis producers declared that they would not produce color sets, one nationally-known manufacturer pointing out that the whirling-disc system is bound to be superseded within a short space of time by a compatible type setup.

Color thunder also roared in other quarters of Washington, as representatives of five manufacturers and a lab (*DuMont, General Electric, RCA, Philco, Sylvania, and Hazeltine*), serving as members of a National Television System Committee, declared that there has been evolved a composite color system which should provide a highly acceptable picture. In a comprehensive report, these specialists offered a group of proposed standards for the new method which stipulated that... picture information can be transmitted by means of a color subcarrier modulated in amplitude and phase with respect to a reference subcarrier of the same frequency, the color subcarrier being transmitted simultaneously with the video signal and during only the video portion of the composite signal. In addition, the sync signals, required to transmit information concerning the reference subcarrier, are to be sent only during the sync and blanking intervals of the composite video signal. To insure practical invisibility of the color subcarrier, it was said that the system requires that the normal frequency, but not phase, of the subcarrier must be an odd multiple of half the horizontal scanning frequency. The color sync signals are to be transmitted by means of a burst of the reference carrier superimposed on the back porch following each horizontal sync pulse.

The committee was of the opinion that the foregoing standards were entirely practical and they provided a sound framework within which the whole TV industry could conduct further testing of high-quality compatible color TV. As a result of this further and detailed testing of the operation of the standards and required equipment, it was expected that numerical values for the standards might be defined shortly by industry. According to the group, it was also expected that those desiring to participate in the design and manufacture of color receiving and transmitting gear would conduct their own product tests, utilizing

(Continued on page 98)

RADIO & TELEVISION NEWS





# CASH-IN ON THIS GRAND CLIMAX

## of Sylvania's big brilliant campaign for Service Dealers

Now begins the second half of Sylvania's greatest and most appealing ad campaign ever offered to Service Dealers.

Featuring 2 famous celebrities, Paulette Goddard and Patrice Munsel, this campaign ties in with big ads soon to appear in the Saturday Evening Post, Look, Life, and Collier's magazine, and is backed by the nation-wide weekly TV show, "Beat the Clock."

### Everything included

Here's everything you need for a record harvest of fall service business. You get big, smashing life-like displays of the famous stars. You get counter cards, streamers, direct-mail pieces . . . even radio spot announcements.

Remember, you pay only one cent each for the mailing pieces. All the rest is FREE! So don't let another minute go by without calling your nearest Sylvania distributor . . . or mail the coupon NOW.



# SYLVANIA

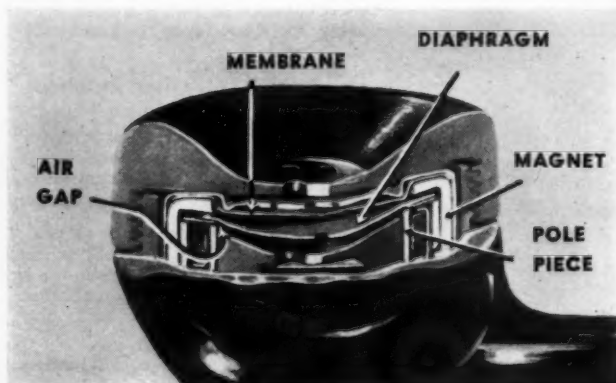
RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS;  
ELECTRONIC TEST EQUIPMENT; FLUORESCENT TUBES, FIXTURES, SIGN  
TUBING, WIRING DEVICES; LIGHT BULBS; PHOTOLAMPS; TELEVISION SETS



Sylvania Electric Products Inc.  
Dept. R-2108B, Emporium, Pa.  
Please send me full details about Sylvania's  
great Fall 1951 Service Dealer Campaign.

Name \_\_\_\_\_  
Street \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

Easy on  
the ear



More naturally than ever, your voice comes to the ear that listens through the latest telephone receiver developed at Bell Telephone Laboratories. The reason: a new kind of diaphragm, a stiff but light plastic. Driven from its edge by a magnetic-metal ring, the diaphragm moves like a piston, producing sound over all of its area. Effective as are earlier diaphragms of magnetic-alloy sheet, the new one is better,

gives more of the higher tones which add that personal touch to your voice.

To work the new receiver, telephone lines need deliver only one-third as much power. So finer wires can do the job. This is another new and important example of the way scientists at Bell Telephone Laboratories work to keep down the cost of telephone service, while the quality goes up.

## BELL TELEPHONE LABORATORIES

WORKING CONTINUALLY TO KEEP YOUR TELEPHONE SERVICE ONE OF TODAY'S GREATEST VALUES



# FREE

**TELLS HOW—**

**WE GUARANTEE  
TO TRAIN AND COACH YOU AT HOME  
IN SPARE TIME UNTIL YOU GET  
YOUR FCC LICENSE**

If you have had any practical experience—Amateur,  
Army, Navy, radio repair, or experimenting.

**TELLS HOW—**

**OUR AMAZINGLY EFFECTIVE JOB-FINDING  
SERVICE HELPS CURE STUDENTS GET BETTER  
JOBS. HERE ARE JUST A FEW RECENT  
EXAMPLES OF JOB-FINDING RESULTS:**

**GETS FIVE JOB-OFFERS FROM BROADCAST STATIONS**

"Your 'Chief Engineer's Bulletin' is a grand way of obtaining employment for your graduates who have obtained their 1st class license. Since my name has been on the list I have received calls or letters from five stations in the southern states and am now employed as Transmitter Engineer at WMMT." Elmer Powell, Box 274, Sparta, Tenn.

**GETS CIVIL SERVICE JOB**

"I have obtained a position at Wright-Patterson Air Force Base, Dayton, Ohio, as Junior Electronic Equipment Repairman. The Employment Application you prepared for me had a lot to do with me landing this desirable position."

Charles E. Loomis, 4516 Genesee Ave., Dayton 6, Ohio

**GETS JOB WITH CAA**

"I have had half a dozen or so offers since I mailed some fifty of the two hundred employment applications your school forwarded me. I accepted a position with the Civil Aeronautics Administration as Maintenance Technician. Thank you very much for the fine cooperation and help your organization has given me in finding a job in the radio field."

Dale E. Young, 122 Robbins St., Owosso, Mich.

**HERE'S PROOF FCC LICENSES ARE OFTEN SECURED  
IN A FEW HOURS OF STUDY WITH OUR COACHING  
AT HOME IN SPARE TIME:**

Name and Address	License	Lessons
Lee Worthy, 2210 1/2 Wilshire St., Bakersfield, Cal.	2nd Phone	16
Clifford E. Vogt, Box 1016, Dania, Fla.	1st Phone	20
Francis X. Foersch, 38 Beucler Pl., Bergenfield, N. J.	1st Phone	36
S/Sgt. Ben H. Davis, 317 North Roosevelt, Lebanon, Ill.	1st Phone	28
Albert Schoell, 110 West 11th St., Escondido, Cal.	2nd Phone	23

**CLEVELAND INSTITUTE OF RADIO ELECTRONICS**  
Desk RN-32, 4900 Euclid Bldg., Cleveland 3, Ohio  
(Approved for Veteran Training Under "GI Bill of Rights")

**TELLS HOW—**

**EMPLOYERS MAKE JOB OFFERS  
LIKE THESE TO OUR GRADUATES  
EVERY MONTH!**

Telegram, August 9, 1950, from Chief Engineer, Broadcast Station, Pennsylvania. "Have job opening for one transmitter operator to start immediately, contact me at once."

Letter, August 12, 1950, from Dir. Radio Div. State Highway Patrol. "We have two vacancies in our radio Communication division. Starting pay \$200; \$250 after six months' satisfactory service. Will you recommend graduates of your school?"

Letter, August 24, 1950, from radio-television sales and service company, Ohio. "We are in need of a good television man. The pay will be good, also good surroundings to work in. Please let us hear from you."

These are just a few of the examples of the job offers that come to our office periodically. Some licensed radioman filled each of these jobs; it might have been you!

Ours is the only  
home study course  
which supplies  
FCC-type examinations  
with all lessons  
and final tests.



**MONEY MAKING  
FCC  
Commercial Radio Operator  
LICENSE  
INFORMATION**

**ACT  
NOW!**

**Get All 3  
FREE**

Your FCC ticket is Always  
Recognized in All Radio  
Fields as Proof of Your  
Technical Ability.

**MAIL COUPON NOW**

**Cleveland Institute of Radio Electronics**  
Desk RN-32—4900 Euclid Bldg.,  
Cleveland 3, Ohio  
(Address to Desk No. to avoid delay.)

I want to know how I can get my FCC Ticket in a minimum of time. Send me your FREE booklet, "How to Pass FCC License Examinations" (does not cover exams for Amateur License), as well as a sample FCC-type exam and the amazing new booklet, "Money-Making FCC License information."

Name .....

Address .....

City..... Zone..... State.....

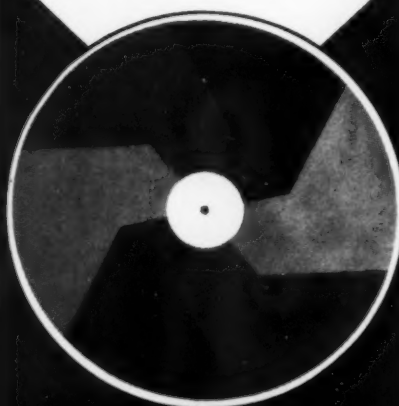
Paste on penny postcard or send air mail.

# HARVEY RADIO CO. Elected "Jobber of the Year" for the Metropolitan New York Region . . . . .

## IN STOCK

## Famous "CELOMAT" COLOR WHEEL

For color television  
on your present  
TV receiver!



Approved by CBS to receive their color as transmitted. When rotated at 1440 R.P.M. in front of any existing TV receiver up to 10 inches, it will bring color television right into your home, providing the set has been converted for color reception. Outside dimensions 22 1/2 inches. Get yours now... be the first to receive color TV in your community... and, as usual, HARVEY is among the first to make it possible.

Low Priced at Only

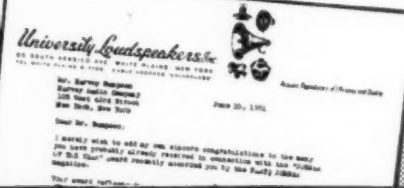
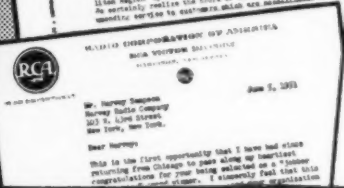
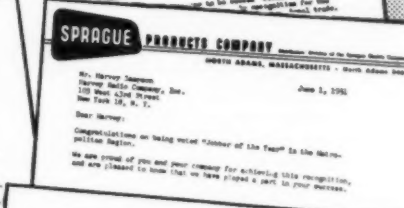
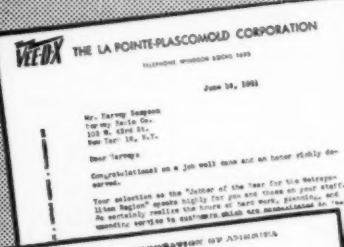
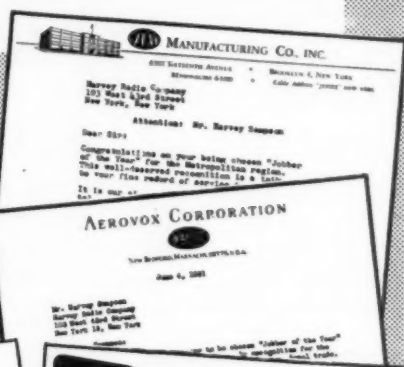
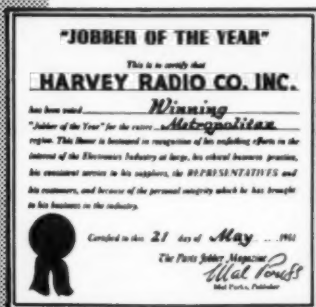
**\$16<sup>95</sup>**

**COLOR CONVERSION MANUAL**

Tells you how to convert your set for color reception. **Only \$1.00**

"In recognition of unfailing efforts in the interest of the Electronics Industry at large, for ethical business practices... and consistent service to customers," the Harvey Radio Co. has been named Winning "Jobber of the Year" for the Metropolitan New York region by the *Parts Jobber Magazine*.

This is an Award not easily given... you have to be good to get it. Harvey customers number in the thousands... all over the world. They know that they can depend upon us for service, values, and the things they want when they need them. Whether you are a broadcaster, an amateur operator, a manufacturer, part of a municipality, or are in Civilian Defense... you can be sure if you BUY IT FROM HARVEY.



"We are proud of your company for achieving this recognition" — Mr. Harry Kalker, Sales Manager, Sprague Products Company.  
 "... a timely recognition for the splendid jobbing job you've done" — Mr. Charles Golenpaul, Sales Manager, Distributor Division, Aerovox Corporation.  
 "... you can well be proud of the outstanding job you have done" — H. F. Bersche, Manager, Renewal Sales, Radio Corp. of America.  
 "... a tribute to your fine record of service to the industry" — Mr. Edward Finkel, Sales Manager, JFD Manufacturing Co.  
 "... your selection as the 'Jobber of the Year for the Metropolitan region' speaks highly for you and your staff" — Jerome E. Respass, President, La Pointe-Plascomold Corporation.  
 "Your award... proves that good deeds and honest leadership are still the seeds of progress" — Larry Epstein, Sales Manager, University Loudspeakers, Inc.

These are only a few excerpts from letters received from leading manufacturers. You, too, will like doing business with HARVEY.

Telephone: **7-1300** **LUXEMBURG 2-1500**  
**HARVEY**  
**RADIO COMPANY INC.**  
 103 West 43rd St., New York 18, N. Y.





# You're Out, Pop!

## The New RAYTHEON TV Picture Tube Warranty Policy Fans Father Time for Distributors and Service Dealers

RAYTHEON TELEVISION PICTURE TUBES are warranted for 6 months from the date they are installed in the customer's Television set!

This means that a Raytheon Tube Distributor or Service Dealer can stock Raytheon Picture Tubes now without fear that the warranty will expire while the tube is in stock.

### HERE'S HOW THIS EASY TO USE RAYTHEON TUBE WARRANTY POLICY WORKS!

Upon installation, a Tube Warranty Registration card (see picture) is filled out and

mailed to RAYTHEON. That's all the Dealer has to do. RAYTHEON records the necessary data and mails a Tube Registration Certificate to the user. Tubes in use less than 6 months failing to give satisfactory service are returned to RAYTHEON with the warranty certificate and receive immediate adjustment.

Add this simple, easily operated Tube Warranty Policy to the superior quality of Raytheon Television Picture Tubes and you'll readily realize why the combination means *no more tube warranty trouble for you.*



*Right for Sight!*

**RAYTHEON MANUFACTURING COMPANY**

Receiving Tube Division

Newton, Mass., Chicago, Ill., Atlanta, Ga., Los Angeles, Calif.

*Excellence in Electronics*

RADIO AND TELEVISION RECEIVING TUBES, CATHODE RAY TUBES, SPECIAL PURPOSE TUBES, SUBMINIATURE TUBES, MICROWAVE TUBES

# new!

ACTUAL  
SIZE



## PYRAMID TINY TYPE 85LPT TUBULAR PAPER CAPACITORS

Fit anywhere!

Suitable for  
85°C. operation!

CAPACITANCE RANGE:

.0001 TO .5 MFD.

VOLTAGE RANGE:

200 TO 600 V., INCLUSIVE

Sturdily built in phenolic-  
impregnated tubes. Ends  
are plastic-sealed.

WRITE FOR COMPLETE LITERATURE  
Representatives and Distributors  
Throughout the U.S.A. and Canada



## PYRAMID

PYRAMID ELECTRIC COMPANY

1445 Hudson Boulevard

North Bergen, N. J., U. S. A.

TELEGRAMS: WUX North Bergen, N. J.  
CABLE ADDRESS: Pyramidusa

# Within the INDUSTRY

**WALLACE R. MacGREGOR**, formerly common-carrier engineer on the staff of the FCC, has joined *Lenkurt Electric Sales Co.* as manager of government sales for carrier telephone and telegraph systems. He will head two new branch offices in Washington, D. C. and Monmouth County, New Jersey.



During the war Mr. MacGregor served with the Navy on the engineering of land-line communications installations for both continental and advance base naval shore establishments.

Previously he held various plant supervisory posts with the *New York Telephone Co.* He is a graduate of Clarkson College of Technology, is a registered engineer in the state of Maryland, and a member of the IRE and AFCA.

**GENERAL ELECTRIC COMPANY** has presented a \$90,000 television transmitter to the University of Illinois, according to an announcement made by George D. Stoddard, president of the university.

The transmitter will be located at the university's Robert Allerton Park, about 25 miles from the main campus where the studio facilities will be erected.

Final channel allocation is not expected until some time this fall.

**W. C. CONLEY, JR.** has been named vice-president and manager of branches of the *Crosley Distributing Corporation*, the wholly-owned subsidiary of the *Crosley Division of Avco Manufacturing Corporation*.

**GERALD GANLEY** is the new director of purchases for *Freed Radio Corporation* of New York. . . . **JAY E. BROWDER** has been appointed chief of the radio communications engineering section of *Kollsman Instrument Corporation*, a subsidiary of *Standard Coil Products Co., Inc.* . . . **LEON HILLMAN**, formerly of New York University's Research Division, has been named to head the engineering department of *Production Research Corporation* of Thornwood, New York. . . . **ALBERT J. ROSEBRAUGH** has been appointed to the newly-created post of manager of distribution for *Philco Corporation*.

. . . **DR. HENRY G. BOOKER** and **JOHN M. BERKOWITZ** have been elected to the board of directors of *The LaPointe-Plascomold Corporation*. Dr. Booker, a professor of engineering at Cornell University and a leading authority on

wave propagation, also acts in an advisory capacity to the company. . . .

**BILL CAMERON** has been named general manager of *Concord Radio Corp.*'s operations. . . . **OID RISO**, advertising and sales promotion manager of *Philco International Corporation*, has been appointed vice-president in charge of advertising. . . . **N. J. MacDONALD** has been named vice-president in charge of operations for *Thomas & Betts Co.* of Elizabeth, New Jersey. . . . **JOHN F. LORBER**, formerly associated with *Raytheon* and *RCA Institutes, Inc.*, has joined the staff of *Hycor Company, Inc.*, as chief engineer. . . . **EDMUND C. BERKELEY** has been elected to the board of directors of *Video Corporation of America*. . . . **FRED GOSSARD** has been named sales manager of *Alprodco, Inc.* of Kempton, Indiana. . . . **PETER H. COUSINS**, who has been with the headquarters staff of Radio-Television Manufacturers Association since 1946, has been named director of information for the association. . . . **JANE DRUCKER**, who for the past three years has served as public relations counsel to "The Representatives," retired on July 15th. "The Representatives" have established national headquarters at 600 S. Michigan Avenue, Chicago 5, Illinois. . . . **DICK MITCHELL** has been named sales manager of *Radio Apparatus Corporation* of Indianapolis. . . . **WILLIAM P. LEAR**, chairman of the board of *Lear, Inc.*, was awarded an honorary degree of Doctor of Engineering by the University of Michigan in recognition of "his tremendous contribution to aviation communication and aircraft stabilization research and development." . . . **LEO G. SANDS** is the new director of public relations and advertising for *Bendix Radio*.

**T. KEVIN MALLEN** has been elected chairman of the board of directors of *Ampex Electric Corporation* of San Carlos, California.

He joined the organization in 1949 and has served as general manager in reorganizing the manufacturing and marketing phases of the company's magnetic tape recorder business.

A native of Ireland, Mr. Mallen was for many years connected with *International Business Machines Corporation* as general manager of its Far Eastern operations.

In addition to his *Ampex* post, he is a managing partner of *Ayala Corporation*, and president of the *Peninsula Symphony Association*. During the



RADIO & TELEVISION NEWS

**GET THIS  
REVISED**

*up-to-the  
minute*

# TUBE MANUAL *NOW!*

*"New durable  
plastic  
fiber cover!"*



*New snap-open  
loose-leaf binder...  
makes it easy to  
add new tube  
data sheets*



**Yours for \$2.00**

**Offers complete reliable tube data . . . required by radio and television technicians and electronics engineers.**

In these days of television, new tube types are introduced nearly every week. Here at last is a tube manual that will keep you always up-to-date.

It's the 8th edition of Sylvania's famous "Technical Manual" in the same convenient 5½" x 9½" size BUT WITH A BRAND NEW PLASTIC FIBER COVER AND SNAP-OPEN LOOSE-LEAF BINDING.

More than 80 new tube types have already been added to this new 8th edition, including all current TV picture tubes.

Typical pages show tube base diagrams, give physical specifications, ratings, typical operation data and curves, application and design details. Tubes listed in numerical order for quick, easy reference.

**Bound in durable plastic**

New, convenient loose-leaf plastic binder enables this

manual to open easily and lie flat on your bench. Quick, snap-open feature permits insertion of additional data sheets. These sheets . . . already punched for your book . . . are periodically mailed to you FREE as inserts in "Sylvania News," Sylvania's free monthly magazine.

Your Sylvania Distributor has these Manuals NOW. Get your copy from him today or mail the coupon with \$2.00 for each copy ordered.

## Here are just a few of the New Tube Types added to the 1951 Manual

OA3	6A56	6BG7	25W4
IN60	6AX6	12AU7	1274
5AX4	6BA5	12BN6	5642
6AB4	6BF7	19BG6	5692
6AJ5	6BQ7	25AU5	5719



# SYLVANIA



Sylvania Electric Products Inc.  
Department R-2108A  
Emporium, Pa.

Enclosed please find \$2.00 for a copy of  
the new Sylvania Technical Manual.

Name \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; PHOTOLAMPS; TELEVISION SETS

August, 1951

25



COMPACT  
FORWARD  
LOBE

for a  
**BETTER  
TV  
PICTURE**

—the right antenna improves the picture quality of your set

This single forward lobe DOES make a fine picture for, as engineers know, it means the antenna is receiving PEAK signals from only one direction . . . The Amphenol Inline\* Antenna has NO minor lobes to pick up reflected, 'ghost' creating signals and other spurious radiations that create poor picture quality.

The Amphenol Inline\* Antenna's superior electrical characteristics and rugged construction are everybody's assurance—jobber, dealer, serviceman and customer—of a TRULY fine picture!

\* REISSUE PAT. NO. 23,273

**AMPHENOL**

war he served as chief of S.E. Asia Branch for G-2, General Staff, Washington, D. C.

**WILLIAM T. BUSCHMANN** has been named merchandising coordinator for the Radio Tube and Television Picture Tube Divisions of *Sylvania Electric Products Inc.*

He was formerly associated with the *Socony-Vacuum Oil Co., Inc.*, as assistant to the Foreign Trade Industrial Relations advisor, coordinating sales training and salary administration programs.

During World War II, he served as a patrol bombing pilot in the ETO. He did experimental work with electronically controlled target drones and attended the Anti-Submarine Electronic Development Project School at Quonset Point, R. I.

Mr. Buschmann is an associate member of the IRE and holds an unlimited commercial pilot's license.



**ROBERT C. SPRAGUE**, president of the *Sprague Electric Company*, was re-elected chairman of the board of directors of the Radio-Television Manufacturers Association at that organization's 27th annual convention.

The board of directors also re-elected Leslie F. Muter as RTMA treasurer for his 16th term and renamed Dr. W. R. G. Baker as director of the engineering department. James D. Secrest was retained as secretary and general manager while John W. Van Allen was reappointed general counsel.

Two new directors were named to the board; Robert S. Alexander, president of *Wells-Gardner & Co.*, and Harlan B. Foulke, vice-president and director of sales of *Arvin Industries, Inc.*

**THE BELL SYSTEM** has made application for permission to expand microwave radio relay facilities in the Upper New York State area, including construction of a new link between Syracuse and Rochester.

On completion, the expanded system would provide a total of six broadband radio relay channels between Albany and Buffalo, four of which would be reserved for long distance telephone message service and two for television transmission.

**HENRY T. ROBERTS** has been appointed vice-president of *Majestic Radio & Television*, Division of *The Wilcox-Gay Corporation*. He will be in charge of the private-brand contract sales department and will also act as sales manager for *Wilcox-Gay* recording products.

During the past 10 years Mr. Roberts has been a free lance manufacturers' sales representative. As executive vice-president of the *J. P. Seeburg Corporation*, from 1937 to 1941, he participated in the introduction of the first illuminated coin phonograph. From 1930 to 1933, he served as vice-president and director of sales for the *U. S. Radio & Television Corporation*.

He will maintain headquarters at *Majestic's* Chicago offices, 743 N. La Salle Street, and at Charlotte, Michigan.



**HELDOR MANUFACTURING CO.** has been organized to manufacture products formerly produced by **HELDOR METAL PRODUCTS CORPORATION**. The new firm has leased space in the industrial building at 225 Bloomfield Avenue, in Bloomfield, New Jersey . . . Formation of a wholly-owned subsidiary, the **CANADIAN WESTINGHOUSE SUPPLY COMPANY**, to distribute the products of the **CANADIAN WESTINGHOUSE COMPANY, LTD.**, has been announced . . . **WILKOR PRODUCTS, INC.**, of Cleveland, Ohio, manufacturers of precision resistors, has been acquired by **AEROVOX CORPORATION**. The present management of the subsidiary will continue to operate the firm . . . A new corporation, **WARSAW PRODUCTS, INC.**, has been organized in Warsaw, (Continued on page 104)



# *They "test-fly" rockets for pennies —to save the taxpayer Millions*

One way to make America stronger is to give our Armed Forces more and better weapons—built without wasting the nation's defense dollars. An example how this can be done is seen in our vital *guided missiles program*.

Using an electronic calculator—an analogue computer developed by RCA Laboratories for the U. S. Navy—the designs of guided missiles can now be tested in the drawing board stage, to save time and money. Information representing the rocket's design is fed into RCA's calculator. Other information represents flight conditions, and the two are then combined to show how the rocket performs . . . at any split second.

Millions of defense dollars — thousands of hours — are saved by these mathematical "test flights." And RCA's calculator will test any man-made device that flies or swims . . . planes, ships, bullets, shells, rockets, submarines.

See the latest in radio, television, and electronics at RCA Exhibition Hall, 36 West 49th St., N. Y. Admission is free. Radio Corporation of America, RCA Building, Radio City, New York 20.



Models of guided missile and bomber about to meet on the plotting board of RCA's computer.

New electronic computer at RCA Laboratories "test-flies" rockets before they are built.



**RADIO CORPORATION of AMERICA**  
*World Leader in Radio — First in Television*

# PRICES Slashed

**OUR \$50,000 STOCK OF RECONDITIONED, "GOOD-AS-NEW" EQUIPMENT MUST GO AT A RECORD-BREAKING SACRIFICE TO MAKE ROOM FOR NEW MERCHANDISE!**

**SAVE UP TO 50% during GIGANTIC CLEARANCE SALE of USED TEST and COMMUNICATION EQUIPMENT**

All instruments thoroughly checked and guaranteed to be in normal operating condition when shipped. While the following is only a partial list of our huge inventory (available at the time this publication goes to press) *bargains like these simply can't last!* So act now and avoid disappointment. Wire, write, phone or use the handy coupon *today!* When ordering, indicate first, second and third choice. All merchandise subject to prior sale.

## COMMUNICATION EQUIPMENT

Babcock P2A Preselector.....	\$ 22.50
Breting 9 Receiver & Spkr.....	25.00
Breting 12 Receiver & Spkr.....	49.50
Collins 75A1 Recvr & Spkr.....	299.50
Collins 75A Recvr & Spkr.....	275.00
Gon-Set 10 meter converter.....	21.95
Gon-Set 20 meter converter.....	21.95
Gon-Set Noise Clipper.....	7.50
Hallcrafters HT9 Transmitter.....	225.00
Hallcrafters HT18 VFO.....	99.50
Hallcrafters SX28 & Spkr.....	119.50
Hallcrafters S38.....	32.50
Hallcrafters S38A.....	34.50
Hallcrafters S38B.....	42.50
Hallcrafters S40A.....	59.50
Hallcrafters S47 less spkr.....	109.50
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RADIO & TELEVISION NEWS

# Your Own Secret Weapon is Electronic Training!

**Radar-guided glider bomb perfected by Navy.** The Bat, first fully automatic guided missile to be successfully used in combat, is now a full-fledged service weapon of the Fleet. The Navy has launched a program to train personnel in technical and operational use. Bats follow their targets through own radar installation, which is in the nose; bomb is carried in fuselage. Official U.S. Navy Photograph.



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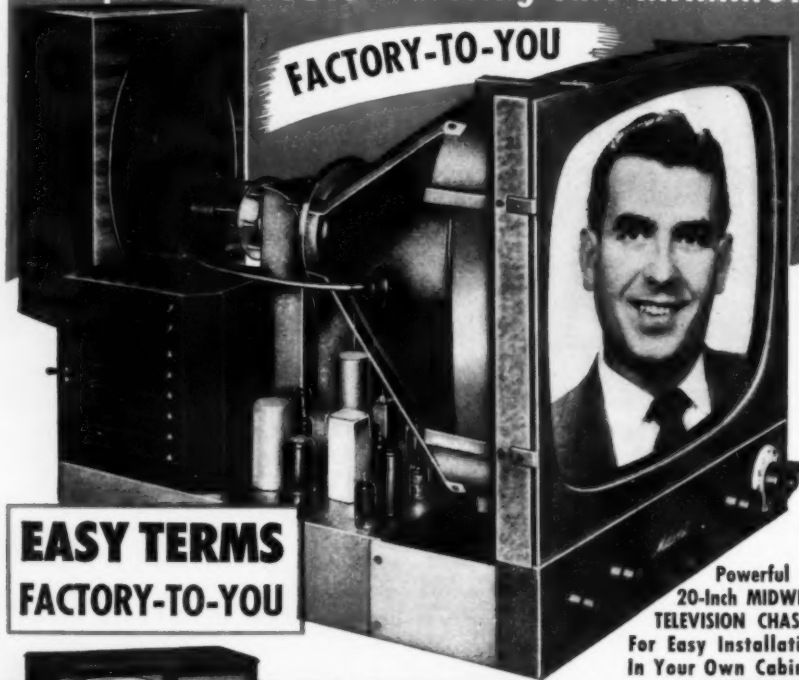
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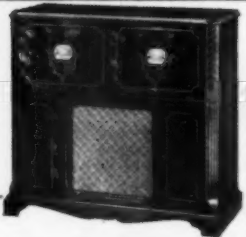
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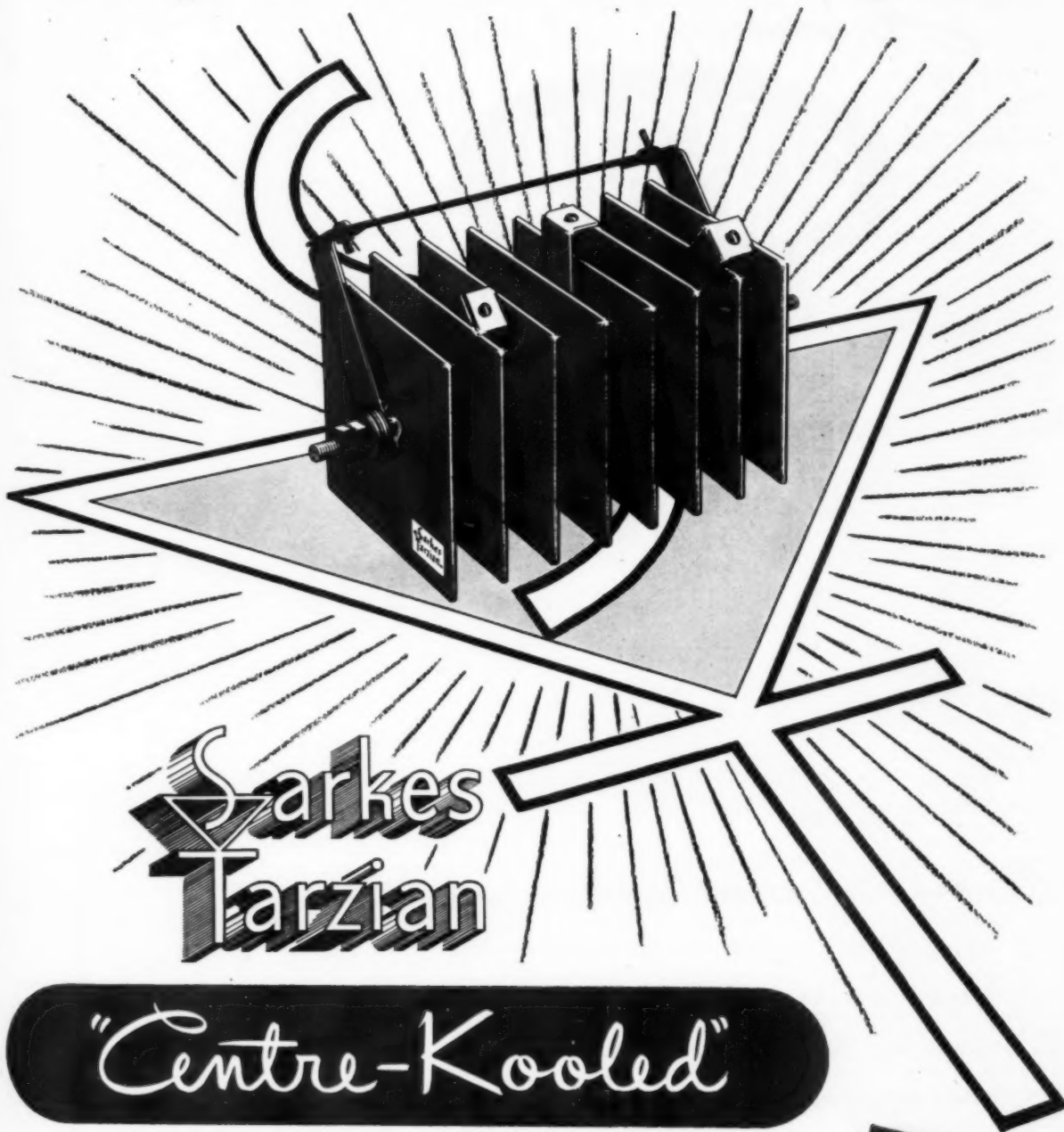
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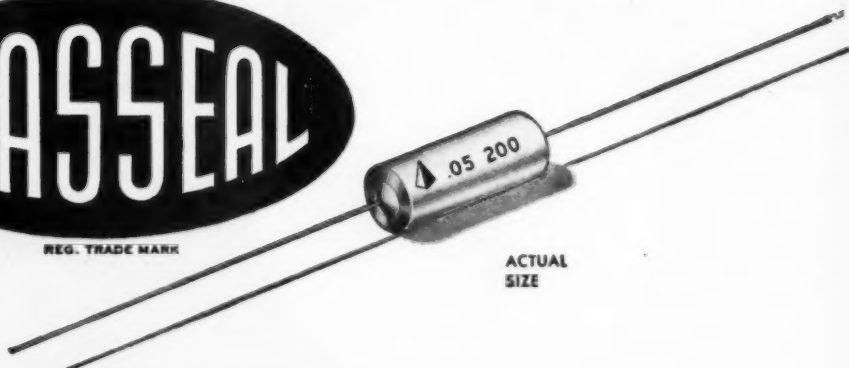
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31

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# A Modern SERVICE CENTER

By  
**MORT FARR**

*How one successful TV dealer is  
combatting the slump by going out  
after video servicing and sales.*



By providing incentives for customers to pick up and deliver their own sets for servicing, Mort Farr has cut the cost of doing video servicing.

**A**T a time when service dealers throughout the country are pulling in their horns, many have questioned my judgment in choosing this particular time to expand my service operation rather than retrench.

To those doubting the wisdom of the move, let me say that I did it because it is good business! Too many dealers have been caught in the wave of pessimism that has been sweeping the industry and are either treading water or have struck out for shore. I have backed up my belief that you can swim against the current by building a new \$75,000 service outlet!

In this building servicing can be done in an environment designed for the skilled professional technician, unhandicapped by cramped, makeshift quarters in a corner of the store. Here reconditioned merchandise can be shown on its own—not where it must compete with new stock. These sets don't have to be given secondary position on the floor or be suggested only when customers aren't willing to pay for new merchandise. It is sold for exactly what it is—used stock put in good working condition so that it will give years of economical service. This sort of merchandising has worked out so successfully that many local department stores have asked us to handle their trade-in sets. Unlike many dealers, we do not consider trade-ins a dead-end street.

## **The Service Shop**

A professional environment, designed to fit the needs of technicians so that they can work with maximum comfort and efficiency, was the goal in setting up the service shop.

August, 1951

The actual service area is 20 x 55 feet in size with windows, eight feet long and eight feet apart, along the length of the room. Work positions are laid out so that each technician is allowed his own eight-foot section of the bench with four feet of window and four feet of wall space.

The bench, like the floor, is of three-inch thick planking so that the heaviest sets can be mounted on it without danger. There is leg space beneath the portions of the bench which run under the window and a storage locker with sliding doors for each man under the other four feet of his work position. This part of the wall is mirrored so that the technician can determine picture linearity while working on the back of the chassis. Above the mirror is a shelf on which the technician can keep the manuals and service notes with which he is supplied.

To further encourage his use of this literature, a bread-board-type pull-out shelf is installed beneath the top of the bench on which he can rest his notes and manuals.

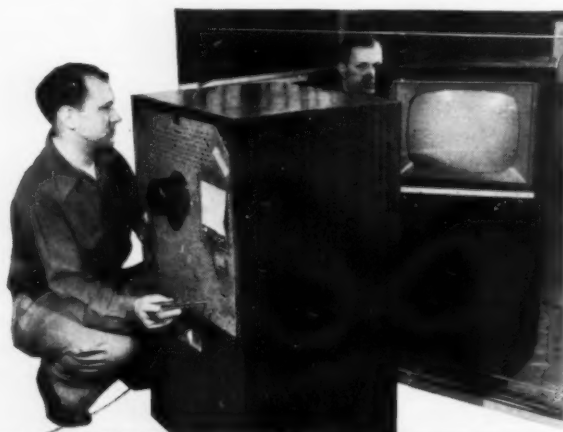
A Jerrold distribution system feeds the incoming television signal to a plug at each work position as well as to the display room where reconditioned sets can be shown in operation. One of the many original features of the service shop is the use of a three-position switch on the plug. This operates a pad which permits the simulation of conditions under which the set will be operated—a strong, medium, or weak incoming signal. In this way the set can be adjusted for the specific location in which it is to be used.

Other plugs at the far end of the room are also equipped with three-position pads so that as many as ten sets being



Over-all view of the service workshop. Carefully planned work areas give each technician elbow room and good lighting.

Linearity checks can be made easily by one technician by placing the receiver in front of a mirror and making the necessary adjustments from the rear of the television receiver.



given operational runs before going out to customers, life tests for new merchandise being considered by the store, or tests on intermittent sets brought in for repair can be handled at one time. This location can be viewed by all technicians in the room, permitting them to monitor the sets under their care without having to leave their benches.

Large, mirror-fronted cabinets, similar to those found in millinery stores, are set against the wall opposite the work bench. These are used for additional storage space and to permit viewing of tubes from the rear when consoles are being adjusted on the floor. There is also an island storage position for incoming and outgoing receivers and chassis when technicians are not working on them.

All new sets are unpacked, tested, and given a 4 to 8 hour run-in before being sent out to customers.

#### Stockroom

One section of the shop is devoted to a stockroom in which we can keep an extensive inventory of tubes, parts, and sub-assemblies to speed service. This room is kept locked at all times to facilitate inventory control. One member of the staff is responsible for the issuance of all materials and for re-ordering needed items.

Each technician is assigned his individual 18" x 18" locker to which he has a key. The lockers are open from the back and accessible from the stockroom. At the end of the day's work, he turns in any tubes still in warranty, his day's service reports, and a list of his requirements for the next day. This material is ready for him in his locker when he reports for work the following morning.

There is ample parking space in the immediate neighborhood for the technicians' cars. Space is also available on a paved parking lot for the loading of chassis and for the convenience of customers.

We are hoping to develop a large business in "cash and carry" TV repairs. We plan an intensive advertising campaign featuring the catch phrase "Bring Your TV Set to the Shop on the Way to Work and Pick It Up on the Way Home." In this way we hope to save manpower and give the customer much faster repairs than if we had to send a man out to pick up the set and then deliver it when it is repaired.

#### Salesroom

Before any merchandise is permitted to go to the salesrooms, it is given a thorough test and inspection for performance, finish, and value. Then it is tagged as approved

← One of the individual test positions in the service workshop showing the type of equipment each technician has available.



for sale and placed on display. Electrical outlets and antenna plugs are installed sufficiently close to each other to permit flexibility in the type of merchandise that can be shown and its arrangement in the room. Attractive floor layouts and displays are given as much consideration here as they are in a store which handles only new merchandise.

Our regular salesmen take turns manning the salesroom for a day. This assures top-level sales personnel at all times and serves to acquaint the staff with trade-in values and the reconditioned merchandise faster and better than would be possible by any other method. Since each salesman has an automobile parked at the main 69th Street store, he can drive customers interested in reconditioned items to the Service Center whenever he encounters these prospects.

In this way, the two stores operate as one, the need for having new and used stock competing for the same sale is eliminated, and an early step is taken toward giving the reconditioned merchandise the importance it must have in the very near future.

Finally it should be mentioned that each of our television technicians is trained to sell the service customer up to a new set through a trade-in deal. Approximately 75 percent of our trade-ins are prompted by these technicians. Their role in building this lucrative business is fully recognized and these fellows have done a nice job.

#### TV Follows Automobile Pattern

The approach to my business was based on the idea that the operation of the television dealer will ultimately pattern itself after the automobile business. In my opinion it will be just as strange, a couple of years from now, for a TV dealer to sell a set to a customer and turn him over to a "service contractor" as it would be for a purchaser of a high-priced automobile to be told that if he has any service difficulties to take the car to some garage.

People buy a TV set for the entertainment it affords and not for what it is. It has no value unless it is performing satisfactorily. Here, again, this differs from radio as many radio sets have operated poorly for years but the customer

didn't know the difference. However, you cannot fool the eye and the purchaser demands much more in the way of performance from a television set.

A successful TV dealer will be required to stock an adequate supply of repair parts and to have on hand at all times the facilities and trained personnel necessary to make the required adjustments on faulty receivers. I believe that one of the foremost requirements of a reputable manufacturer will be that the dealer who handles that manufacturer's products be just as interested in servicing the set intelligently as he is in selling it. I know of no factor which influences more purchasers than the personal recommendation of a friend, neighbor, or relative who is pleased with the performance of a particular set and the service rendered on it. Dissatisfaction is broadcast faster and more widely than satisfaction, so guard your reputation jealously and make every attempt to keep your customers happy.

Another point to remember in drawing the comparison between the TV business and the automobile industry is the trade-in problem. Some years ago, the automobile dealers of America woke up and found their capital all on the used car lot. They recognized the need for merchandising these cars at a profit and for providing transportation for that segment of the population that couldn't afford new cars. From now on a TV dealer's ability to merchandise sets in volume will depend on his ability to dispose of the trade-in sets at a profit. This will require servicing facilities for reconditioning so that they can be sold with a guarantee. He must also have a showroom for the display and sale of these reconditioned sets.

The future of television servicing indicates that the art will get more complex as we advance. The day of the screwdriver mechanic is past and we are staking our future on a profession that promises to be a really big business in the not-too-distant future. If television lives up to its predictions, I want to be part of that billion dollar industry! There will be plenty of dealers to lap up the gravy—but the best way to insure your share of the business is to go into it, stick with it, and boost it! —30—



Reconditioned sets are sold in a specially-located sales area and not in competition with new merchandise. William Alberti (left) and Mort Farr look over one of these reconditioned jobs.

Over-all view of the new \$75,000 Farr service building which houses the service facilities and a showroom for used TV sets.

# Round-the-World

## VOICE RADIO SYSTEM

By  
**CAPT. W. WALDO LYNCH**

Communications Superintendent  
Pan-American World Airways System

***Pan-American's globe-circling airways system is protected by an elaborate radio communications net.***

COMMUNICATIONS passed another milestone recently with the inauguration of a Round-the-World Voice Radio System. Pan-American World Airways' thirty-two high-frequency radio ground stations, located on sixteen continents and islands, weld the airline's 19,687-mile voice radio chain around the earth. This development has eliminated the necessity for sending and receiving messages in Morse Code; air-ground communication is now handled by Pan-American airline pilots.

Most of the stations are operated by the civil aviation authorities of the various local governments with the exception of those stations, shown on the map on the facing page, in the U. S. and its territories operated by Aeronautical Radio; in Bangkok operated by ARINC of Siam; and the stations in Germany and the one at Manila which are operated by PAA. When we began developing radiotelephone for air-ground service over long international routes, we found that in order to install a chain of stations covering a wide geographic area we had to promote what is known as "network operation." All these stations had to have common frequencies. On the long routes each station had to be equipped with frequencies of the order of 3-5-8-11 and quite often 17 or 18 mc. All the ground stations had to guard all of the frequencies assigned to their network, simultaneously and continuously.

We arrived at the requirements for the various orders of frequencies after

studying the particular areas to be covered. By this I mean, we first considered a geographic area such as the Atlantic and decided that we would try to cover the whole Atlantic area as one network. We then took a look at the distance between the various stations of the network and we imagined aircraft flying at any point in the area. We then studied the propagation tables to see what frequencies would be required in order to allow any aircraft in the area to contact one of the ground stations at any time of the day or night. A better understanding of what we were trying to do might be gained by this example. Consider this region as a square bounded by four stations. The sides of the square are 1000 miles. We could place an aircraft at any point in this area and an inspection of the propagation tables might indicate that we would need frequencies on the order of 3 and 8 mc. to provide 24 hour service without skipping over. It would also be apparent that the 8 mc. frequency would be high enough to travel the maximum distance required.

The selection of the actual frequencies depends, to a great extent, on international agreements, location with respect to the geographic area involved, and the attitudes of the various nations which must approve the frequencies.

At this point, since we have partially described a network, it might be well to continue with its description. Let's take another look at this network built around the 1000 mile square

**A PAA ground station at New Delhi, India, one link in world-wide radio chain.**

with stations at the four corners. First, each of these stations is equipped to transmit and receive on each of the frequencies which have been selected for operation. Each station has operators who listen to each of these frequencies at all times.

As some of our networks become more complicated and extend over longer distances, conditions prevail when an airplane cannot always contact the primary or control station on one of the frequencies assigned to the network. In this case, the ground operators are trained to listen to all communications and they seem to sense immediately how the frequencies are propagating. Immediately they understand that possibly an aircraft signal is skipping the control station because they hear the control station making other contacts but not with the aircraft in question. They also hear the aircraft call the other station, but they do not hear the control station answering the aircraft. The operators are trained to recognize situations such as these, and an operator at a secondary station then calls the aircraft and offers assistance. The pilot, hearing this return call, gives his communication to the ground station which then relays it to the control station.

This brings up another point. The control station in a network changes from time to time and there may be several control stations operating at the same time. The control station, for an individual aircraft, is the sta-



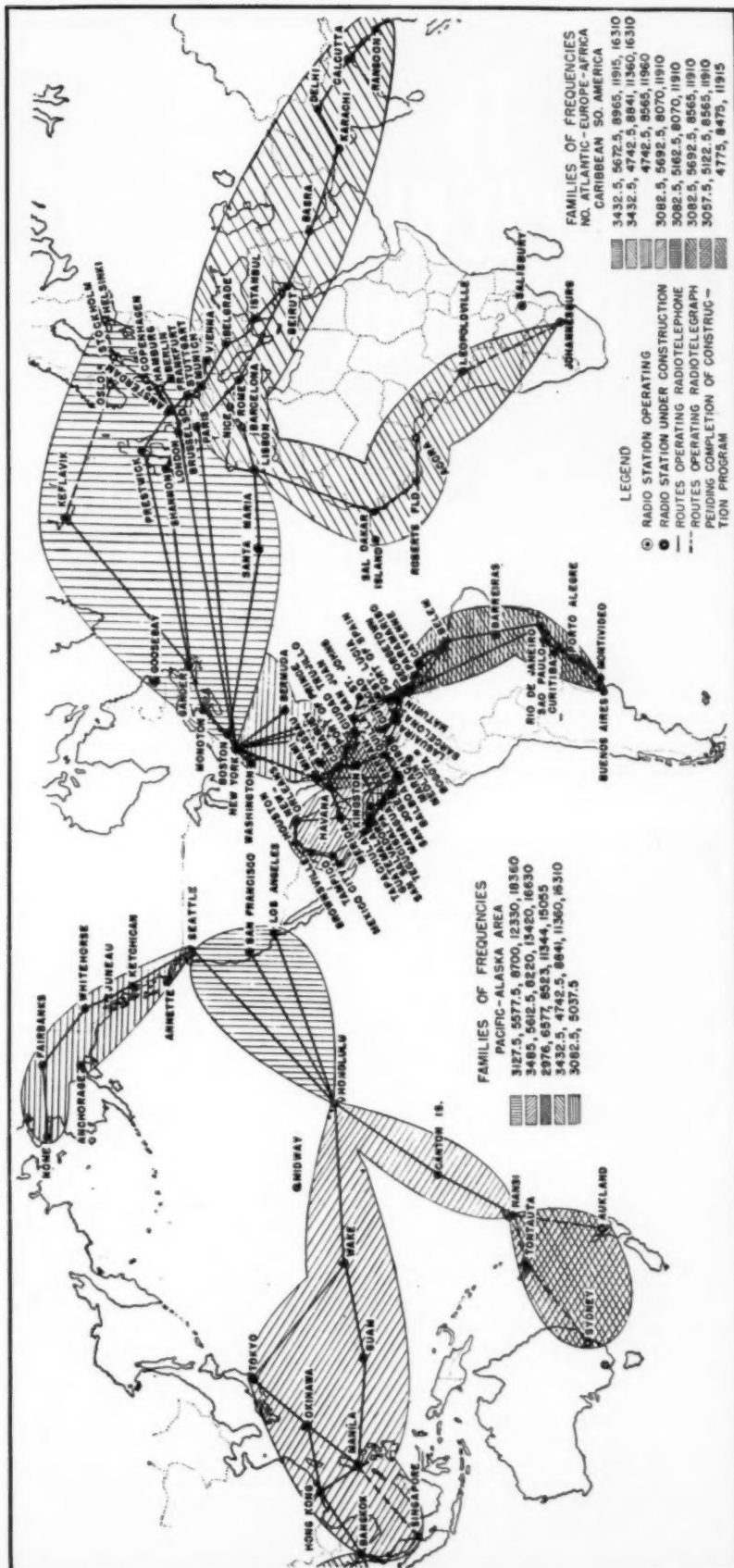
**Pan-American's world-wide radio system  
map showing principal ground stations.**

tion located in the airways traffic control region within which the aircraft is flying at the time. The reason for this is that the pilot will receive all his instructions and clearances from that air traffic control center, and he will naturally attempt to have direct communications with that radio station. Failing to do this on any one of the frequencies at his command, he will then set up contact with any other station able to contact the control station directly, and failing that, he will attempt to make contact in two relays. The pilot is not particularly burdened with this problem since the ground operators immediately step in and assist in setting up the most direct flow of communications.

In the early days of our operations we found that it was absolutely necessary to have crystal-controlled transmitters and receivers at all the ground stations and aboard the aircraft. We also found that all of the aircraft equipment had to be push-button operated.

All the ground transmitters used in the world-wide system are multi-channel units. A typical example is the *Collins* 23 ID transmitter. This is a 3 kilowatt unit which has automatic tuning on ten preselected channels. The frequency range is from 2 to 20 mc. Each channel is crystal-controlled and the transmitter is shifted by remote control through a dialing system. *Collins* also makes a 400 watt transmitter which works on the same principle. We also use a number of *Wilcox* 96-C transmitters. These are 2½ kilowatt units with a power supply, a modulator, and separate radio frequency bays. Each r.f. bay is equipped with coils which fit into various bands. Any number of bays up to ten can be added with each bay set on a desired frequency. This transmitter is also shifted through a remote control dialing system. We have a number of *Federal* type FTR-3 transmitters. These are 3 kilowatt jobs of the same basic type as the *Wilcox* 96-C. In South America we have a number of 400 watt *Western Electric* 4WTF transmitters. These are two-channel, three-frequency transmitters which have a single power supply and modulator, two r.f. sections, one of which has a double crystal holder and a small switch so that two frequencies within 3% can be tuned up in the same channel. The 4WTF is housed in a single rack about two feet square. The more powerful transmitters are built up in separate units. Also in South America we have a number of transmitters which comprise units designed and built by a former *Pan-American* subsidiary company. The driver is a 12 ACX-2. This includes a power supply and two r.f. channels built in the same rack. The 12-ACX2 feeds an RFA-50 which is a 4 kilowatt r.f. amplifier. The RFA-50 is modulated with a GM 40 which is

(Continued on page 106)





# TV PICTURES IN COLOR

By  
**NORMAN CHALFIN**

*Starting in the East, CBS colorcasting will spread to other major television areas in the near future. With a few changes in sweep circuits and a color disc, you can experiment with your small screen receiver and obtain a full color pattern.*

**T**HE rainbow has been brought to your TV screen. The recent Supreme Court ruling approving commercial telecasting of color video programs in the field sequential system developed by CBS opens up a new field for the TV technician in which to apply his talents and earn new income. It just may be that this rainbow does have a pot of gold at the end of it.

Conversion of your present TV black and white receiver is by no means a complicated operation. With the seven inch sets that many folks have now relegated to the basement playroom, the den, or the kids room, it is but a matter of a couple of hours' effort and less than five dollars' expenditure to adapt it for the different sweep frequencies used in the field sequential color system. This will provide reception of the color broadcasts in black and white. Color reproduction will require a color converter.

For sets with larger screens, or for projection receivers, color adaptation and conversion will be more costly and require somewhat more effort, but can be accomplished successfully and much to the delight of all who watch.

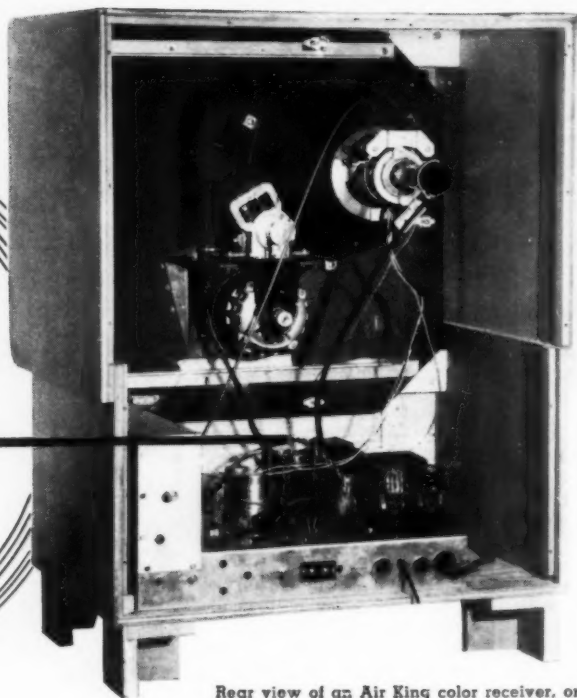
Most technicians are familiar with the sweep frequency standards for black and white TV. They provide 30 interlaced field frames per second and in each frame there are 525 horizontal lines. The horizontal sweep frequency is thus  $30 \times 525$ , or 15,750 cycles per second. Since each frame contains two

fields, the vertical sweep frequency is 60 cycles per second.

The color television system thus far approved has a line structure of 405 per frame. Each frame contains the three primary colors used to produce the color picture and occurs in  $\frac{1}{4}$ th of a second. The color fields are also interlaced as in black and white. The color fields are scanned in the order red, blue, green. The first sweep in red scans lines 1, 3, 5, . . . the odd lines, while the blue scan which follows covers lines 2, 4, 6, etc., the even lines. The third scan with the green filter in place again takes in the odd lines. The fourth time around is red, scanning the even lines. Now we have one full frame in red. The fifth scan fills in blue odd lines and the sixth the green even lines. Each field then covers only  $202\frac{1}{2}$  lines and when the six fields are scanned all three colors have been covered in interlaced sequence. Hence, the name field sequential color system. Each field lasts  $\frac{1}{4}$ th of a second. A complete sequence of colors is scanned in  $\frac{1}{4}$ th of a second. There are six color fields scanned in  $\frac{1}{2}$ th of a second to make up a complete color frame.

From the foregoing description it can be seen that the field frequency must now be 144 cycles. This is the vertical sweep frequency. The horizontal sweep frequency will be 405 lines  $\times$  24 frames  $\times$  3 colors. This equals 29,160 cycles.

The adapter for color TV permits



Rear view of an Air King color receiver, one of the first scheduled to go into production. Deliveries are planned for early this Fall. A selector switch on the front panel permits reception of all present channels in monochrome or color. Set employs a rotating disc placed between the front of cabinet and the face of picture tube. When using a rotating disc, the largest useful screen size is  $12\frac{1}{2}$ ". It is not impossible to make a set, which is basically the same as the one shown, using the revolving drum. The color drum revolves across the longitudinal axis of the picture tube. With this arrangement larger screen sizes are possible. The tri-color tube could also be used, however at present time there are certain production difficulties to be overcome which may take as long as several years to resolve before sets using tri-color tube are produced in reasonable quantity.

the sweep oscillators to operate at 144 cycles for vertical, and 29,160 for horizontal. Since in both cases this is a higher frequency than for the black and white TV sweep generators, the frequency is changed by a decrease in the value of horizontal and vertical hold control values.

In Fig. 2 there is illustrated several well known circuits of the sweep oscillator sections of commercial seven inch TV receivers. These are the simplest units to adapt for reception of the 405 line, six field per frame color transmissions. In every case there is a limiting resistance in the grid of the oscillator section of the sweep generator, before the hold control. The hold control in all the seven inch TV receivers was on the front panels. It is therefore desirable that this should not be changed. The only change is made in the limiting resistance. Reducing the value of the limiting resistance to about 10,000 or 20,000 ohms will be sufficient to produce a value that will make frequency hold adjustment possible with the original hold control for



The reduction in sweep oscillator grid resistance in either a cathode coupled multivibrator, or in a blocking oscillator, generally results in a lowered output amplitude of the oscillator. The picture, because of this, will be a smaller size than in the black and white position. For the more athletic users of the set it will be no great chore to go behind the set each time it is switched for color and readjust the size controls. It is not too expensive and much more convenient to install an extra pair of size controls for horizontal and vertical which are once adjusted for the color size requirement and then need not be touched again. The size control for color should match the one for black and white to which it corresponds. In some circuits the size control is in the plate load circuit (*Teletone*, 149; *Belmont*, horizontal; *Motorola* 71, horizontal only, etc.) or in the grid of the vertical deflection amplifier, as in *Hallcrafters*, etc., or as a "B" supply bleeder as in the *Hallcrafters* T54.

For the *Teletone*, the *Motorola*, and any others in which the size controls are part of the plate load, only a four-pole, double-throw switch is required.

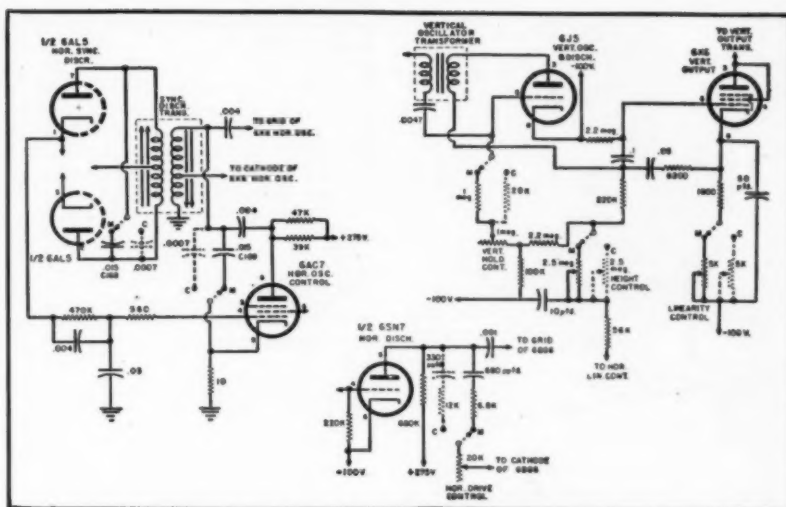
Where the size control is part of the amplifier input grid circuit or part of a "B" supply bleeder, a six-pole, double-throw switch will be needed.

To adapt a circuit such as the *RCA* 630TS, the changes illustrated in Fig. 1 are required. Six points must be switched here also. This is the basic arrangement. The many commercial variations of the 630 follow the same circuit arrangement up to the output of the 6BG6G tube. As a result, supplying details of what to do with this part of the circuit becomes difficult to accomplish without confusion.

It is quite obvious from the circuit why the capacity value was changed in the horizontal discriminator circuit. If it were not done the control circuit would not follow. (This is  $C_{im}$  in the original).  $C_{im}$ , the reactance coupling condenser, is changed for the same reason. The horizontal drive is also changed so as to provide a more suitable pulse shape for the higher frequency. In the vertical circuit the changes are much the same as for the 7<sup>th</sup> set circuits described previously.

No difficulty should be encountered with the vertical portion of the circuit.

The fact that there is a higher frequency and the different pulse shape in the horizontal circuit, the retrace portion of the pulse with its higher velocity is likely to produce nearly twice as much voltage in the high voltage system. In some of the designs submitted by the CBS people, new transformers were shown to get around the problem presented in this way. In many sets there have been no change at all and satisfactory results have been obtained.

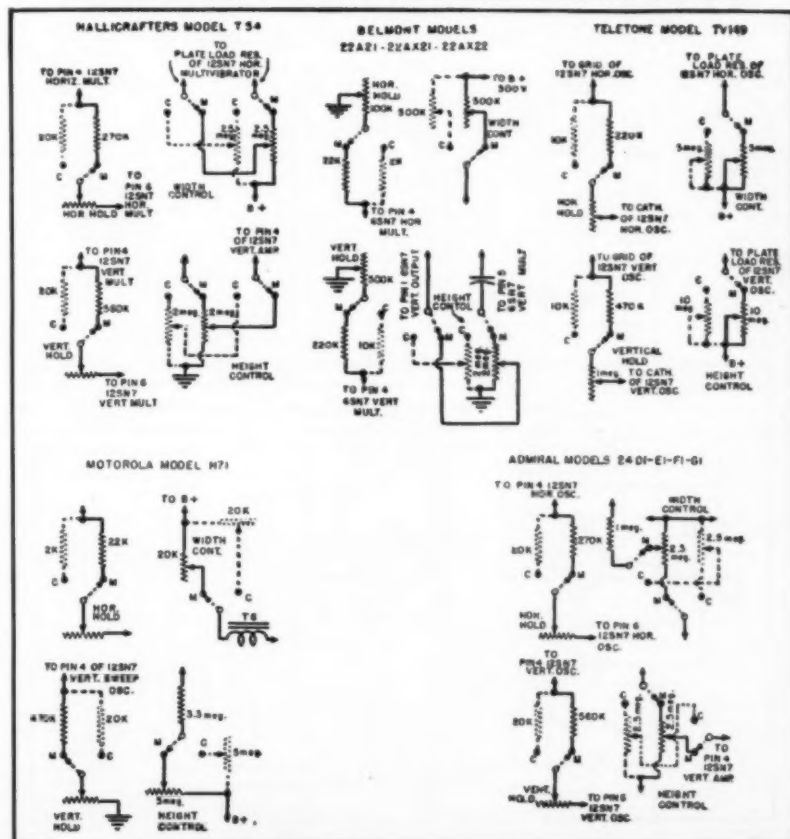


**Fig. 1. Circuit changes (shown dotted) required to adapt the RCA 630TS and 6TS 30 to color. Other commercial versions of the 630 chassis must be handled differently.**

One technique that is probably the kind of approach practical manufacturers are taking is to build a separate adapter unit as is illustrated in Fig. 4.

This is the circuit furnished by CBS as an adapter for the RCA 9T246 which employs a "synchroguide" type of horizontal a.f.c. With it plugs are placed

Fig. 2. Circuit diagram of the sweep oscillator section of several commercial 7" receivers. The changes, as shown in dotted lines, affect only the vertical and horizontal sync and size adjustments. These conversions are extremely simple and a few resistors, potentiometers, and switches are the only components required. Although these particular conversions are simple it should not be assumed that all receivers can be as easily adapted to CBS color. Many receivers are difficult to convert and will require much more elaborate changes than those indicated here.



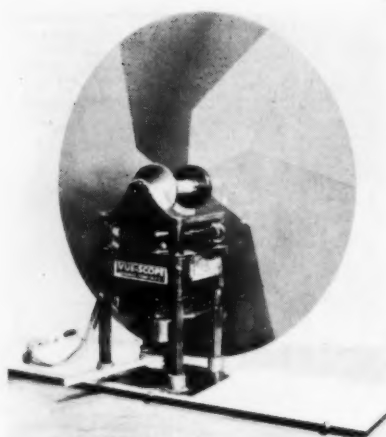


Fig. 3. A commercially built color conversion disc assembly manufactured by Celomat Corporation of New York. The assembly includes a 12-inch disc, built out of Fibestos cellulose acetate plastic sheeting, and a manually operated synchronization unit. A unit similar to this but with an automatic synchronizing control is available in kit form from the above company. A 12-inch plastic disc provides a picture of about 6 inches. Picture magnifier incorporated provides larger image.

under the vertical sweep circuit and amplifier tubes with the switching accomplished outside the receiver in the adapter unit. The horizontal circuits are completely new in the adapter and the 6BG6G is inserted through a plug in the adapter. All switching in the horizontal system is in the adapter with circuits providing horizontal deflection voltages and high voltage d.c. for both the monochrome and color positions entirely produced within the adapter. The details of the special high voltage output transformer in the horizontal deflection circuits are given in the table shown with Fig. 4. Full electrical details are shown in the circuit. The layout and wiring of the chassis is a matter of individual choice. The only specific precautions which must be observed are shown in the diagram at the three points where low capacity wiring is indicated, and at the shielding of the vertical oscillator cable.

In receivers obtaining their high voltage for the CRT from other than flyback deflection sources, such as r.f. power supplies or (as in the Norelco "Protelgram" or Duo Vue projection systems) from a 1000 cycle pulse supply, the changes required may be made as in the design for the 630 or for the

9T246 as shown in Fig. 5. In these instances there is no concern with the particular problem which results from the flyback high voltage supplies.

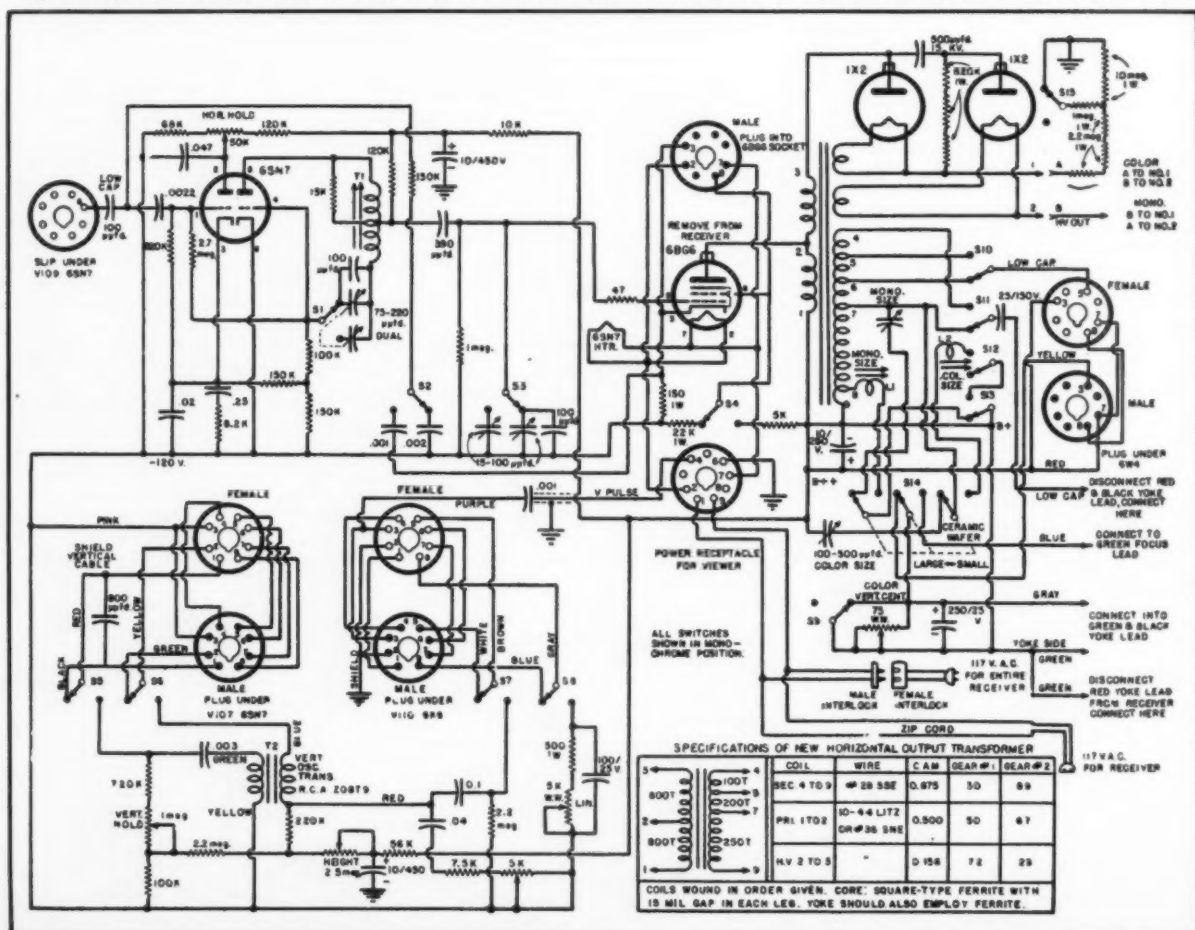
It is important to be reminded that all of the circuit information provided in this article is designed only to provide adaptation of monochrome TV sets so that they may receive, in monochrome, the color programs which will be broadcast.

To receive the picture in color a second device is required. This is called the color converter and in its most elementary form consists of a segmented wheel with six color sectors, i.e., red, blue, green, red, blue, and green.

This disc is large in comparison with the tube size, running from two to three inches larger than twice the raster size. The color segments used in the disc must be made up from specific shades of red, blue, and green in order to provide maximum color fidelity. Materials which have proven satisfactory include the Eastman Kodak filters designated the Wratten 26 (red), Wratten 47 (blue), and Wratten 58 (green).

In order to keep the colors from running together (false color mixtures) the filter must move parallel (Continued on page 80)

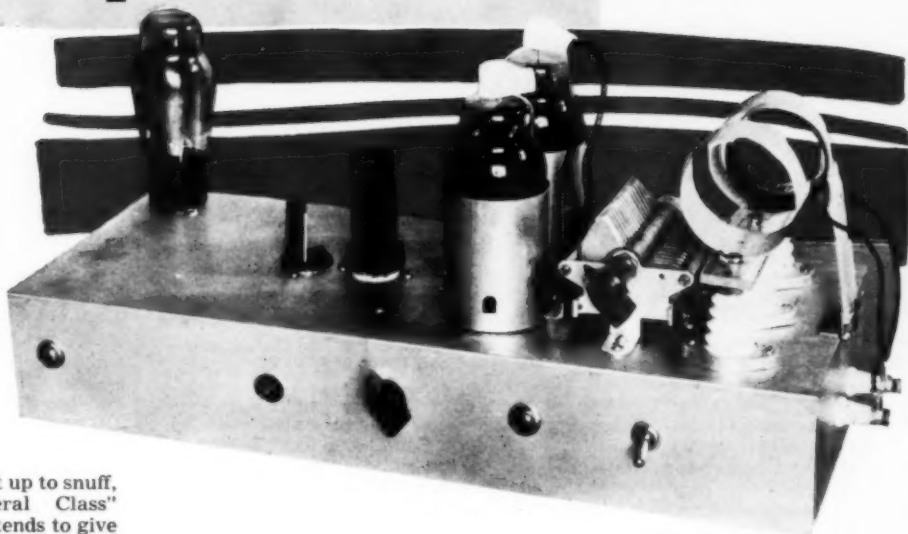
Fig. 4. Adapter unit designed to be used with the RCA 9T246 receiver. This well-engineered unit is suitable for commercial conversion work.



# 160 METER RIG Using Clamp Tube Modulator

By  
**STAN JOHNSON**  
WOLRV

Over-all view of 160 meter rig built by the author. The controls are (l. to r.): mike jack, pilot light (P.L.), tuning condenser (C., C.), metering jack (J.), the switch (S.).



***The clamp tube modulator described herein can be added to any rig using a pair of 807's or 1625's.***

**W**ITH 10 meters not up to snuff, many a "General Class" (Class B) ham intends to give the lower frequencies a whirl. If he is a confirmed phone man this means 160 meters—the only low frequency phone band open for the General Class ticket.

Getting a 10 meter rig to operate on 160 meters is quite a trick—so much of one, in fact, that in most cases it is easier to start all over again and build a rig for 160. Fortunately, a 160 meter r.f. section can be quite simple. If a modulator is already available, the investment in parts is not very great.

The rig described in this article was built up primarily for use with a standard class B modulator. However, a clamp tube modulator was built-in, so that the transmitter is entirely self-contained. This feature may pay off some day if the rig is needed for emergency or Civilian Defense work. Further, the clamp tube modulated rig is an ideal unit for the ham with a lean pocketbook. At a later date, a standard 60 watt audio unit can be added for plate modulation.

The clamp tube modulator section is indicated in the schematic, Fig. 2 (everything within the dotted lines), as a unit, and it can be added to any rig using a pair of 807's or 1625's, whether in push-pull or parallel. Such a rig will really go places on 10 meters when the band is open, as you know, if like the writer, you have heard VE1YO up in Nova Scotia pound in 10 db over S-9. VE1YO uses a pair of 807's screen modulated.

The design of the transmitter is straightforward—but it often helps in building to know the "why" of some of the circuit. First, a 6AG7 was chosen as the oscillator tube, because it is the best shielded of the tubes of its type

available. Further, it lends itself ideally to the "modified Pierce" circuit which in theory, at least, provides the equivalent of a "buffer" stage—with only one tube.

The 6AG7 drives a pair of surplus 1625's (identical with 807's except for 12.6 volt heaters and different socket connections.) The 807's are shown in the diagram. These are used in push-pull. Push-pull was chosen instead of the more common parallel arrangement because push-pull amplifiers are not as subject to parasitics and other troubles as are parallel hook-ups.

The built-in clamp tube modulator is a triode-connected 6L6G. The 1625's require very little audio for screen modulation, the 6L6G being adequate when driven with a single-button microphone.

It will be noticed in the circuit that there are, in effect, two screen grid dropping resistors,  $R_1$  and  $R_2$ .  $R_1$  is the standard dropping resistor, which cuts the voltage from the high voltage supply down to a value (approximately 250 volts) suitable for normal operation of the amplifier. When switch  $S_1$  is opened, resistor  $R_2$  is cut into the circuit, further lowering the screen voltage, dropping it down to a value which makes screen modulation possible with the clamp tube. To use the rig with a standard class B modulator, switch  $S_1$  is closed, the 6L6G pulled from the socket, and the modulated

plate voltage applied to the high voltage terminal.

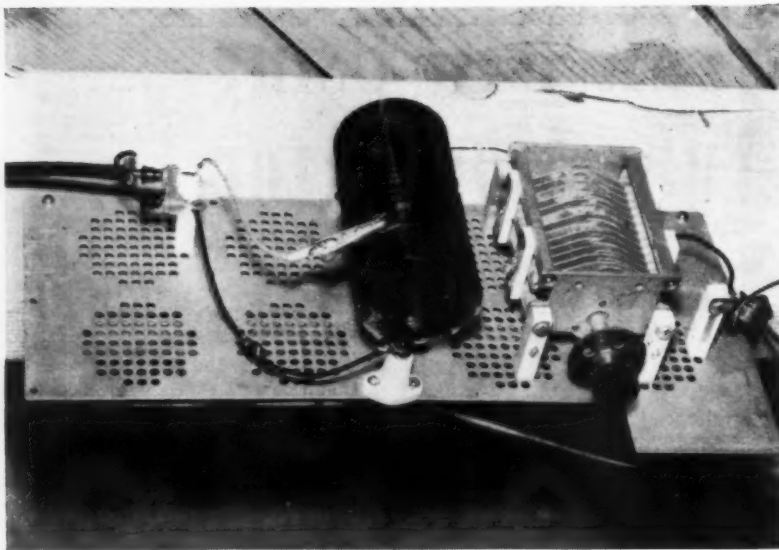
The transmitter is built up on a standard 3 x 7 x 17 inch chassis. The crystal oscillator circuit (except for the tube) is mounted *below* the chassis, including the coil. This makes it possible to shield the input from the output circuit of the transmitter, and eliminates any necessity for neutralizing.

The tuning condenser  $C_2$ ,  $C_4$ , across the oscillator coil ( $L_1$ ) is a standard broadcast band type dual variable condenser of approximately 350  $\mu$ fd. per section (try to find an old one, with as much spacing as possible between plates.) The coil  $L_1$  is of such a size that the condenser will tune *both* 160 meters and 80 meters without changing coils. This greatly simplifies band-changing—going to 80 requires only a different plate coil in the output circuit of the final amplifier.

The small trimmer condenser  $C_3$  is intended to insure proper balance of the grid drive to the amplifier. Its adjustment seems to be anything but critical—in fact, omitting it will probably cause no harm. If you do include it, set it at approximately half capacity.

Parasitic suppressors,  $RFC_1$  and  $RFC_2$ , are connected to the grids of the tubes (right at the tube sockets) and are made up simply by winding 18 turns of No. 22 d.c.c. wire on a  $\frac{1}{4}$ "





Antenna tuner used by the author. Wiring diagram is shown in Fig. 1A. The antenna consists simply of a straight wire 130 to 160 feet long. The length is not critical.

diameter resistor which can be of any high value (for example, 50,000 ohms). The resistor serves simply as a coil form—a piece of polystyrene rod can be used instead.

Standard manufactured 160 meter coils can be used for the final amplifier if desired. However, many jobbing firms do not stock coils for this

band. Furthermore, you can save several dollars by winding your own.

As illustrated, the coil,  $L_2$ , for the amplifier is mounted on a polystyrene strip fitted with three banana plugs. The coil is made up of No. 22 d.c.c. wire and is self-supporting.

To make the coil, first of all prepare a winding form. The best thing for the purpose is a heavy cardboard mailing tube, which should be approximately  $2\frac{1}{4}$ " in diameter. This tube should be wrapped with a few layers of waxed paper. Then the coil is wound in the usual way and given a heavy coat of coil dope or china cement. After the coil is thoroughly dry, remove the mailing tube form carefully by pulling it apart with long nose pliers. The coil which remains is surprisingly strong.

The antenna pick-up coil,  $L_1$ , is wound in the conventional way on a piece of bakelite tubing of approximately the same diameter as the plate coil. The antenna coil,  $L_2$ , is mounted on a piece of polystyrene, which, in turn, is fastened to a small hinge affixed to the chassis. This hinge is made "stiff" by hammering on the rolled-over metal portion which carries the hinge pin. Flexible leads connect the antenna pick-up coil with a pair of insulators which serve as a connection for the antenna.

The microphone battery  $B_1$  (a single flashlight cell) is carried under the chassis, supported by a metal bracket. No microphone switch is included—which is OK if you remember to unplug the microphone when you go off the air. If the mike is left plugged in, the battery will run down.

To eliminate the meter in the oscillator circuit, a standard dial light is connected to a piece of hookup wire to form a long loop  $L_3$ , and this is stuffed inside the oscillator coil form. Varying the length of lead inside the coil form will vary the coupling. Sufficient radio frequency energy will be picked

up to light the bulb when the oscillator is oscillating. The bulb is mounted in front of the chassis in a rubber grommet.

As with any rig, it is a good idea to test out the oscillator section first with the amplifier tubes plugged in and the 45 volt "C" battery connected, but the high voltage not connected.

Rotating the oscillator tuning condenser should make the dial light,  $PL_1$ , light up. If this checks out OK, connect a milliammeter in series with the grid bias battery and measure the grid current. It should be 8 ma., or somewhat less. If higher, raise the value of either  $R_1$  or  $R_2$ , so as to lower plate voltage on the oscillator. This is an important matter—higher grid current will cause erratic operation of the amplifier and make modulation difficult.

With the grid current in line (should it be lower than 6 ma. reduce the value of  $R_1$  or  $R_2$ ) you are ready to try the rig out under load. Initially this can be done by connecting a 75 watt light bulb to the antenna pick-up coil. A milliammeter can be plugged into the jack ( $J_1$ ) to allow reading plate current (as well as grid and screen).

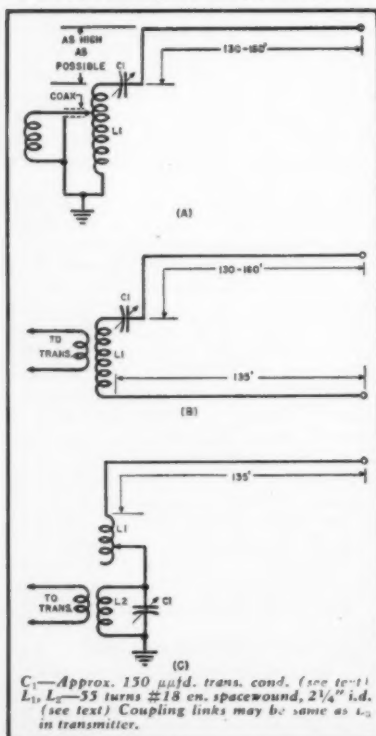
If the 75 watt bulb lights up fairly well and the resonance dip as indicated on the milliammeter is sharp and clean, the rig is probably performing OK and you are ready to hook it to an antenna.

Getting up a suitable antenna for 160 meters is quite a trick inasmuch as the ideal antenna would be a vertically polarized half-wave radiator. This would mean 266 feet straight up—and yes, there is a ham (W5AOE) who has such an antenna, which once belonged to a commercial broadcasting station. Of course, such an antenna is out of the question for most hams—and there are a couple of antenna designs which are practical for the average backyard.

The simplest of these is shown in Fig. 1A. It consists simply of a wire 130 to 160 feet long (length not critical) "worked against ground." The straight up and down portion should be as long as possible since it does most of the radiating.

This antenna has an Achilles heel in that the ground connection must be good, and good grounds are hard to come by. The usual cold-water-pipe ground is seldom good enough. At the writer's station, a fairly good ground was achieved by driving a pipe into a window well alongside the north side of the house, dumping a couple of bags of salt into the well, and then periodically soaking the whole thing down by running the garden hose on it. The result is a ground which has reasonably low resistance. Even so, unless you are lucky enough to live alongside of the ocean or Great Salt Lake the antenna counterpoise arrangement shown in Fig. 1B is a better idea. The counterpoise (strictly speaking it is not that but it performs the same function) can be a wire strung close to the ground at any convenient height and in most any shape. For example, it

Fig. 1. Antenna tuners for 160 meters. (A) Simple Marconi as was used by author and illustrated in photograph above. (B) and (C) Alternate methods that could be used. (B) Counterpoise and (C) voltage fed.





can be run close to the ground along a hedge—or at clothesline height across the backyard.

If you haven't room for a counterpoise, another "out" is shown in Fig. 1C. Here  $L_2$  and  $C_1$  tune to the 160 meter band as a parallel-tuned resonant circuit.  $L_2$  adds sufficient length to the antenna so that it tunes up just as if it were a 266 foot wire, in other words, is fed as a voltage fed Hertz. This procedure eliminates the importance of a ground connection capable of handling high current without loss. The tap on  $L_2$  is determined by experiment, being the value which gives the best loading.

One of the photographs shows a simple antenna tuner which is suitable for use with the Marconi antenna, and with some modification, with the others. The metal base and the tuning condenser are from a tuning unit of a BC-375 transmitter. The coil is "home-brewed," following the same general procedure used in building the plate coil for the transmitter. In this case, No. 18 enameled wire is used, and spaced out by winding No. 22 wire (or heavy cord) between the turns as the turns are put on. Then the No. 22 wire is removed, and the coil doped with ribbons of Duco china cement, approximately 1 inch apart around the circumference of the coil. Use plenty of cement, and after it has dried for a couple of days, put on a second layer. Allow two or three more days for drying, then peel out the cardboard form, as described previously.

The position of the tap on  $L_2$ , Fig. 1A must be determined by experiment (start with the 10th turn). The idea is to use the tap which gives the best loading. Coil  $L_2$  is purposely made plenty big, so that it will load up almost any wire.

In tuning up, rotate  $C_1$  for peak r.f. as indicated by a standard flashlight bulb on a pick-up loop. Go easy, as tuning will be sharp.

If the rig is used with a standard modulator, it is loaded up like any other rig. If the clamp tube modulator is used, one important thing is to use plenty of antenna coupling, more than would be used normally. Unless heavy antenna loading is used, the rig may modulate down, as indicated by the bulb and pick-up loop. Increasing the antenna coupling should cure this, if not, the only solution is to increase the value of  $R_5$  and thus lower screen voltage.

For clamp tube modulation, the screen voltage as measured at the screen should be approximately 135 volts (switch  $S_1$  open). Plate-to-cathode voltage on the 6L6G clamp tube (this voltage controlled by adjusting  $R_5$ ) should be about 250 volts.

Frequencies available for 160 meter operation are as follows:

Mississippi River to East Coast U. S., except Florida and Gulf states: 1800 to 1825 kc., and 1875 to 1900 kc. Final input shall not exceed 500 watts day, 200 watts night.

Mississippi River to West Coast U. S.,

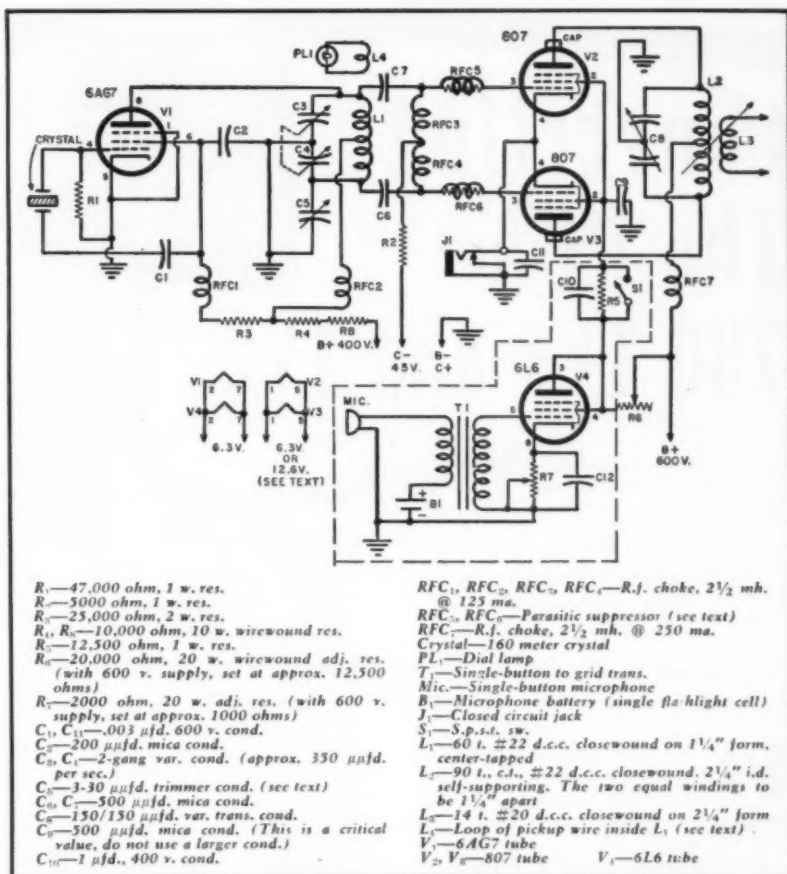


Fig. 2. Schematic diagram of 160 meter rig. In using the clamp tube modulator it is important to have plenty of antenna coupling, in fact, more than that normally used with other types of modulators. A separate power supply is required.

except Gulf states: 1900 to 1925 kc., and 1975 to 2000 kc. Input 500 watts day, 200 watts night, except in the state of Washington where daytime power is limited to 200 watts and nighttime power to 50 watts.

Florida and Gulf states: 1800 to 1825 kc., and 1875 to 1900 kc. Input 200 watts day, no operation at night.

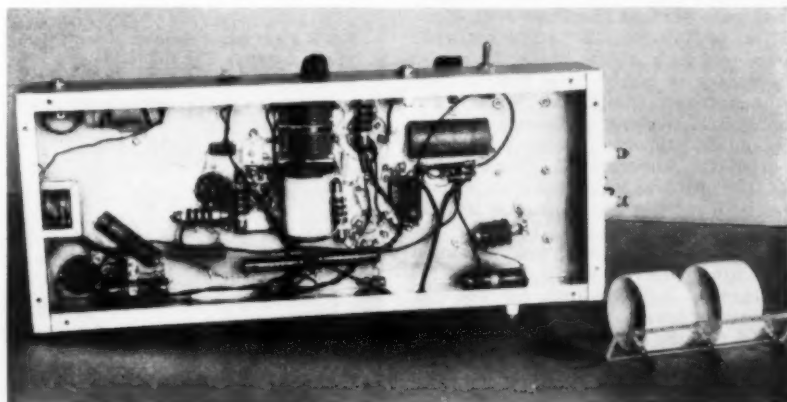
Puerto Rico and Virgin Islands: 1900 to 1925 kc. and 1975 to 2000 kc. Input 500 watts day, 50 watts night.

Hawaiian Islands: 1900 to 1925 kc., and 1975 to 2000 kc. Input 500 watts day, 200 watts night.

Don't expect miracles with a clamp tube modulated rig in heavy QRM. You'll have to substitute good operating for power and find times to operate when the competition isn't too stiff. The next best bet is to get into a "round table" and let a couple of high power buddies keep the channel open!

—30—

Under chassis view of the 160 meter rig using clamp tube type modulator.



# Converting The RCA- 730 TV1 and TV2\*

By

**ROLAND KEMPTON**

Editor, "Techni-talk"

**Complete details for converting a well-known 10" television set to use a 14" rectangular CR tube.**

**F**OR the past several months we have been publishing information on converting some of the early, small-screen television sets for use with the larger tubes.

This month's conversion covers the RCA Models 730 TV1 and 730 TV2, a radio-phonograph-television receiver using a 10" tube. A photograph of the Model 730 TV2 after conversion is shown in Fig. 1. The Model 730 TV1 uses the same chassis in a slightly different cabinet.

Due to the limited cabinet space in the Model 730 TV2, the *General Electric* 14CP4 fourteen inch rectangular picture tube was the largest size that could be used without major cabinet changes. Because of the size and weight of this combination receiver, only the TV chassis and the front panel, shown in Fig. 2, were removed from the customer's home.

First, the 50 degree deflection yoke was replaced with a 70 degree deflection yoke such as the *Todd-J-70*, *Merit MD1*, or *Stancor DY-7*. The old yoke was used as a wiring guide. It is also necessary to remove the high voltage compartment shield and replace the horizontal sweep transformer in order to obtain sufficient width with good horizontal linearity. A *Stancor* No. A-8128 unit was used, however, a similar type such as the *Stanwyck* No. 998 may be used with equal success. A No. 979, listed as a separate item in the *Stanwyck* catalogue as the replacement coil windings for the No. 998 transformer, may also be substituted for the original windings. Re-

\*These conversion notes originally appeared in the December-January 1951 issue of *General Electric Company's* copyrighted publication "Techni-talk."

placing the windings on the original horizontal sweep transformer will result in a considerable saving over replacing the entire unit. The width control was not used and the two wires were taped and not reconnected into the circuit.

A 500  $\mu$ fd. condenser was connected across the horizontal windings of the yoke. This connection was made between the center terminal of the horizontal centering control and pins 4 and 6 of the 5V4G damper tube. The 6BG6G screen resistor was changed from 4700 ohms to 17,000 ohms and the "B+" side was connected to the "B+" boost voltage which was available at terminal 1 on the horizontal sweep transformer. The "B+" side of the 1000 ohm resistor ( $R_{100}$ ) in the vertical output transformer circuit was also transferred to the "B+" boost voltage.

A piece of shielding was attached to the graphite coating on the picture tube, using several pieces of *Scotch*

Fig. 2. Front panel close-up of the TV receiver shown in Fig. 1. The 10" and 14" masks show the increased size obtained.

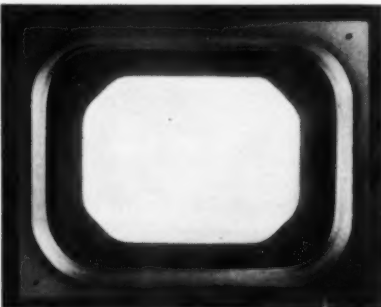


Fig. 1. RCA Model 730 TV2 after being converted to use a 14CP4 rectangular CR tube.

tape. The other end of the shielding was fastened to the chassis when the picture tube was inserted to provide a ground connection.

The ion trap magnet coil could not be used due to the fact that the neck of the 14CP4 is shorter than the 10BP4 with which the set was originally equipped. This was not disconnected, however, as it was part of the negative voltage supply circuit. It was taped to the chassis and a new *General Electric* Cat. No. RET-003 ion trap magnet was used as a replacement.

The 14CP4 picture tube was inserted and the necessary electrical connections were made. It was necessary to adjust the horizontal drive and horizontal linearity controls as well as the height and vertical linearity controls in order to provide a symmetrical test pattern.

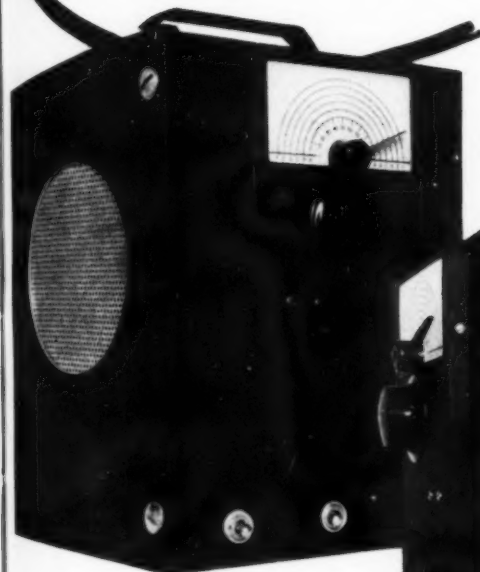
## Cabinet Changes

The front panel which was removed from the cabinet is shown in Fig. 2 with the old 10" mask in back of the new plastic 14" mask. This panel was marked with a scribe using a 14" cardboard template which was centered over the old opening. This template was made by using the larger perimeter of the beveled portion of a 14" mask for size. Incidentally, these templates should not be discarded but kept for future use. The section marked off was cut out using a key-hole saw. Four holes were drilled and countersunk as shown in Fig. 2 and the plastic mask was mounted onto the wooden panel, using four small brass screws.

The chassis and front panel were returned to the customer's home and placed in the cabinet. The inside wooden panel which supports the bell of the picture tube was also changed

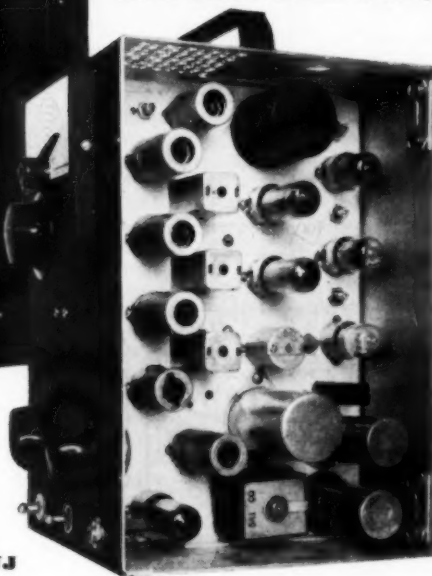
(Continued on page 115)

# A 2 Meter Transmitter-Receiver for Civil Defense Operation



*Although originally designed for civilian defense,  
this rig can be used for general 144 mc. operation.*

Fig. 1. Front view of compact transmitter-receiver (left) and top view of chassis which is mounted vertically.



By

**M. KIRCHHOFF, W2FAR**

Columbia Broadcasting System

and

**D. D. BULKLEY, W2QUJ**

International Tel. & Tel. Corp.

**A**LTHOUGH this compact transmitter-receiver unit was designed primarily for Civil Defense network operation, it may also be used in virtually all types of amateur operations in the 144- to 148 megacycle frequency range, with excellent results. These include portable, mobile, and emergency operations or just "rag-chewing" from the home station. Extremely small and compact, the transmitter, receiver, and power supply are housed in a portable cabinet 9½ inches high, 7 inches wide, and 6½ inches deep. It weighs less than seven pounds.

The receiver, an extremely selective and stable superheterodyne, uses miniature tubes and components. An i.f. as well as an a.f. gain control is provided to permit reception of very strong local signals without overloading the second detector. The audio output of the receiver is ample to drive the self-contained five-inch loudspeaker to several watts.

The transmitter, which is crystal-

controlled, uses miniature tubes and components throughout. It provides over five watts of output r.f. power with excellent modulation quality. The antenna may be mounted directly on the cabinet or, in the case of a remote beam antenna, may be fed by coaxial cable.

The power supply is an efficient, stable, voltage-doubling, full-wave selenium rectifier circuit. Selenium rectifier power supplies are becoming more and more popular, largely because of the space-saving factor, ease of operation, and the fact that no rectifier filament voltage is necessary. These features far outweigh the small amount of extra care needed to install and operate them.

The transmitter-receiver unit was designed for 117-volt a.c. power input so that it could be used in the home station as well as for emergency operation. For operation away from 117 volt a.c. mains, a miniature vibrator power supply unit such as that marketed under the trade name of "Trav-

electric," is ideal. Units such as this may be operated from any six-volt storage battery and will deliver an output of 117 volts, 60 cycles, at better than 35 watts, which is more than ample to supply the power requirements of both the transmitter and the receiver. In addition, these units are available with an adapter that plugs into the cigar-lighter socket on the dashboard of any automobile.

Referring to Fig. 1, it may be seen that all receiver controls are conveniently located on the front panel. The i.f. gain control is located on the left side of the front panel and the a.f. gain control at the right. The filament and primary switch is placed at the lower left, while the plate voltage switch is mounted in the center at the bottom edge of the panel. The microphone input jack is mounted at the lower right-hand corner. A type 10039 *Millen* dial mounted in the center of the front panel for receiver tuning was found to be ideal in size and facility, and also pleasing and professional in appearance. As the transmitter was designed for crystal-controlled network operation, no transmitter controls were brought out to the front panel. This precludes the possibility of the tuning controls being accidentally knocked out of adjustment when the transmitter is operating as a portable or mobile unit. These controls are, however, easily accessible by simply removing one of the "snap-lock" side covers of the cabinet. Once the transmitter is tuned up there is no need for further adjustment, except when changing crystals.

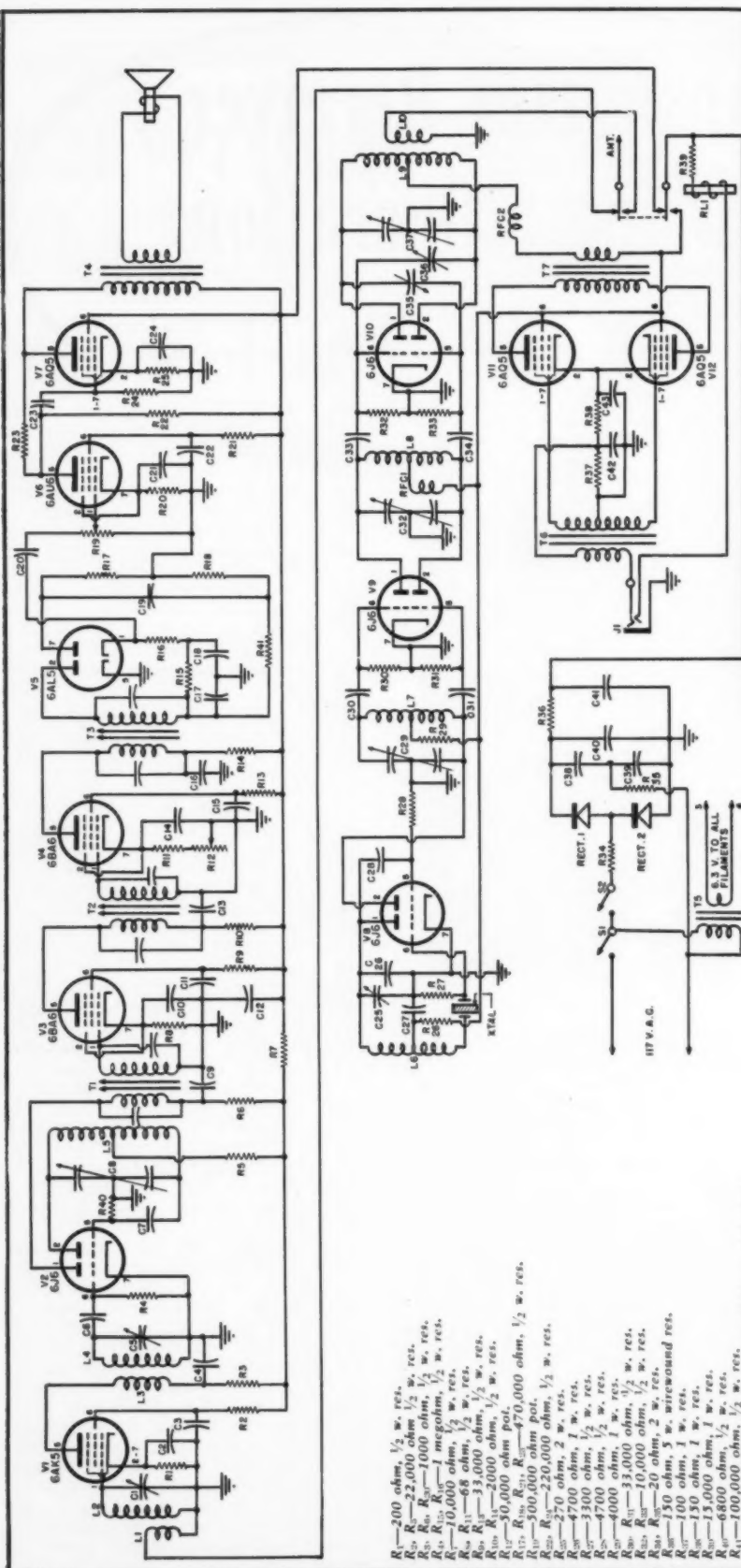
Mechanically, the transmitter and the receiver are laid out in a manner that allows short leads and compact construction. There are no cramped corners to make wiring or servicing difficult. The cabinet formerly housed the "gold-plated" u.h.f. test oscillator, so widely advertised by surplus outlets. This cabinet provides "snap-lock" covers for the two sides of the equipment with a convenient metal-carrying handle on the top. The transmitter and the receiver are mounted vertically on a chassis made of heavy sheet aluminum. Flanges are bent at the top and bottom ends of the chassis and it is bolted into place. Alternatively, a



In the lower part of Fig. 1, the receiver is seen on the left and the transmitter, modulator and power supply on the right. Starting from the top, the receiver consists of a 6AK5 r.f. amplifier, followed by a 6J6, one section of which is used as the local oscillator, and the other as mixer. The 6BA6, next in sequence, is used as a 10-megacycle i.f. amplifier. This is followed by a second 6BA6 i.f. amplifier. The three miniature i.f. transformers may be seen here. Following the i.f. amplifier is a 6AL5 second detector/noise limiter. The diode section of the 6AL5 provides excellent noise suppression, so essential in mobile operation. The second detector feeds a 6AU6 audio amplifier, followed by a 6AQ5 beam power audio output stage.

The transmitter is located at the right-hand side of the photograph just above the three large condenser cans.

**Fig. 2. Complete schematic diagram of the two-meter, self-contained transmitter-receiver.**



$T_{\text{max}}$ —Microphone trans. ("Quace"™)  
 12000 ohm, 12000 ohm, 2000 ohm, 2000 ohm  
 (Stancor A3812) Surplus trans. used

Spkr.—5% FM speaker

Xel.—2 mcs. fundamental

$L_1$ —2 mcs. airwind, at gnd. end of  $L_2$

$L_2$ —1.2 mcs. airwind,  $7/16$ " dia.,  $3/8$ " long

$L_3$ —3 mcs. airwind,  $7/16$ " dia.,  $3/8$ " long, at gnd. end of  $L_4$

$L_4$ —4 mcs. airwind,  $3/8$ " dia.,  $1/2$ " long

$L_5$ —5 mcs. airwind,  $3/8$ " dia.,  $1/2$ " long

$L_6$ —1.4 mcs. airwind,  $1/2$ " dia.,  $3/8$ " long, tapped at 180°

$L_7$ —1.4 mcs. airwind,  $1/2$ " dia.,  $3/8$ " long

$L_8$ —4 mcs. airwind,  $3/8$ " dia.,  $3/8$ " long

$L_9$ —4 mcs. airwind,  $3/8$ " dia.,  $3/8$ " long

$L_{10}$ —2 mcs. airwind,  $7/16$ " dia.,  $3/8$ " long

$V_1$ —6AK5 tube

$V_2$ —6AR5 tube

$V_3$ —6AR5 tube

$V_4$ —6AL5 tube

$V_5$ —6AU6 tube

$V_6$ —6AU6 tube

$V_7$ ,  $V_{11}$ —6AQ5 tube

$R_1$ —200 ohms,  $\frac{1}{2}$  w. res.  
 $R_2$ — $R_9$ —22,000 ohm  $\frac{1}{2}$  w. res.  
 $R_{10}$ — $R_{12}$ —1000 ohm,  $\frac{1}{2}$  w. res.  
 $R_{13}$ — $R_{14}$ — $R_{15}$ —1 megohm,  $\frac{1}{2}$  w. res.  
 $R_{16}$ —10,000 ohm,  $\frac{1}{2}$  w. res.  
 $R_{17}$ —68 ohm,  $\frac{1}{2}$  w. res.  
 $R_{18}$ — $R_{19}$ —30,000 ohm,  $\frac{1}{2}$  w. res.  
 $R_{20}$ — $R_{21}$ —30,000 ohm,  $\frac{1}{2}$  w. res.  
 $R_{22}$ —30,000 ohm,  $\frac{1}{2}$  w. res.  
 $R_{23}$ —300,000 ohm pot.  
 $R_{24}$ — $R_{25}$ —170,000 ohm,  $\frac{1}{2}$  w. res.  
 $R_{26}$ —300,000 ohm,  $\frac{1}{2}$  w. res.  
 $R_{27}$ —270 ohm, 2 w. res.  
 $R_{28}$ —3700 ohm,  $\frac{1}{2}$  w. res.  
 $R_{29}$ —4300 ohm,  $\frac{1}{2}$  w. res.  
 $R_{30}$ —4700 ohm,  $\frac{1}{2}$  w. res.  
 $R_{31}$ —4000 ohm,  $\frac{1}{2}$  w. res.  
 $R_{32}$ —35,000 ohm,  $\frac{1}{2}$  w. res.  
 $R_{33}$ — $R_{34}$ —35,000 ohm,  $\frac{1}{2}$  w. res.  
 $R_{35}$ —30 ohm, 2 w. res.  
 $R_{36}$ —150 ohm, 3 w. wirewound res.  
 $R_{37}$ —100 ohm, 1 w. res.  
 $R_{38}$ —150 ohm, 1 w. res.  
 $R_{39}$ —15,000 ohm, 1 w. res.  
 $R_{40}$ —6800 ohm,  $\frac{1}{2}$  w. res.  
 $R_{41}$ —100,000 ohm,  $\frac{1}{2}$  w. res.  
 $C_1$ — $C_5$ —5  $\mu$ fd. midjet var. cond. (Johnson 160-102)  
 $C_6$ — $C_9$ — $C_{10}$ —100  $\mu$ fd. ceramic cond.  
 $C_{11}$ — $C_{12}$ — $C_{13}$ —100  $\mu$ fd. ceramic cond.  
 $C_{14}$ —30  $\mu$ fd. var. cond.  
 $C_{15}$ —3  $\mu$ fd. butterfly cond. (Johnson 160-205)  
 $C_{16}$ — $C_{17}$ —1000  $\mu$ fd. ceramic cond.  
 $C_{18}$ — $C_{19}$ — $C_{20}$ — $C_{21}$ — $C_{22}$ — $C_{23}$ —0.02  $\mu$ fd., 400 v. cond.  
 $C_{24}$ —100  $\mu$ fd. ceramic cond.  
 $C_{25}$ — $C_{26}$ —1  $\mu$ fd., 400 v. cond.  
 $C_{27}$ — $C_{28}$ — $C_{29}$ —0.01  $\mu$ fd., 400 v. cond.  
 $C_{30}$ — $C_{31}$ — $C_{32}$ —10/10/10/10  $\mu$ fd., 50 v. elec. cond.  
 $C_{33}$ —13  $\mu$ fd. var. cond.  
 $C_{34}$ —13  $\mu$ fd. ceramic cond.  
 $C_{35}$ —680  $\mu$ fd. ceramic cond.  
 $C_{36}$ —15  $\mu$ fd. ceramic cond.  
 $C_{37}$ — $C_{38}$ —11  $\mu$ fd. butterfly cond. (Johnson 160-2-2)  
 $C_{39}$ —Neutralizing cond. of 72 ohm twin-lead (see p. 10)  
 $C_{40}$ —40  $\mu$ fd., 450 v. elec. cond.  
 $C_{41}$ —40  $\mu$ fd., 450 v. elec. cond.  
 $RFC_1$ —RFC<sub>2</sub>—R<sub>1</sub>, choke (Ohmite  $\pm$ 2144)  
 $Sec_1$ —Rect.—5-gate, 100 ma. selenium rectifier  
 $Sec_2$ —Mike jack  
 $Sec_3$ —Mike jack  
 $Sec_4$ —Mike jack  
 $Sec_5$ —Mike jack  
 $Sec_6$ —Mike jack  
 $Sec_7$ —Mike jack  
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A 6J6 harmonic oscillator doubler, utilizing an 8-megacycle overtone crystal, provides output at 48-megacycles. This is fed to a 6J6 push-pull frequency tripler. The tripler delivers a 144 to 148 megacycle (depending upon fundamental crystal frequency) signal which drives a single 6J6 push-pull final amplifier. The final amplifier may be safely loaded to over seven watts' input. The modulation transformer is seen at the top of the photograph next to the 6J6 final amplifier tube with the two push-pull 6AQ5 modulator tubes directly below it. A single-button carbon microphone is used because of its high output. This eliminates the necessity of speech amplifier stages. In order to do away with the necessity for a battery the circuit  $R_{\pi}$  and  $R_{\pi}$  in the cathode of the 6AQ5 modulators provides the required voltage to power the microphone.

Construction-wise, the transmitter and receiver were built with extreme care given to keeping all leads as short as possible. It is also important to use a common ground point for all ground connections. Independent circuit grounds and long ground wires frequently form tuned circuits with stray wiring capacitance and produce annoying spurious oscillations.

Coil winding information will be found in the parts list. Self-supporting coils were selected so that the coils, when mounted in the equipment, may be compressed or expanded to produce minor inductance changes when tuning up. After aligning operations, however, several coats of coil dope should be applied to the coils so that their inductance will not change during operation due to vibration, etc.

A five-inch loudspeaker is mounted on the left side-cover. A hole slightly smaller than the loudspeaker is cut, and covered with wire screen material to protect the speaker. A short length of 300-ohm twin-lead is used to feed the loudspeaker. One end of this cable is terminated by a crystal adapter plug which fits into a crystal socket. This crystal socket is mounted on the underside of the equipment chassis. With this arrangement, it is possible to remove completely the side-cover containing the loudspeaker.

In mounting the power supply  $C_{\pi}$  must be insulated from the chassis, otherwise the voltage doubler circuit will be shorted to ground. This necessitates that  $C_{\pi}$  and  $C_{\pi}$  be separate units.

The 6J6 final amplifier tube is simply and effectively neutralized by using two-inch lengths of 72-ohm twin-lead. The capacity between the two conductors of this line is sufficient to neutralize the final amplifier.

An ordinary 117-volt a.c. antenna and power changeover relay would have been impractical for use in this equipment due to the high current drawn by the relay coil. Therefore, a very unique and simple relay circuit was used. A Leach type 1077-CBF relay was chosen as it had the correct contact arrangement and h.f. insula-

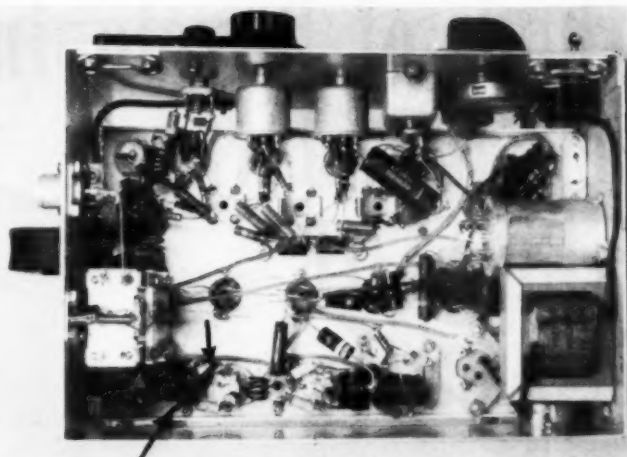


Fig. 3. Bottom view of chassis. Note filament transformer at lower right, loudspeaker receptacle at top right, and antenna relay at bottom left. Short lengths of 72 ohm twin-lead, used for neutralization, are indicated in the photo by arrows.

tion. The relay coil was replaced by a Leach coil number 361 (removed from a Leach type 1251 relay in our case). The number 361 coil has a resistance of 10,000 ohms and is designed for 120 volt d.c. operation. In the circuit diagram  $R_{\pi}$  drops the d.c. plate voltage to approximately 120 volts, which is sufficient for correct operation of the re-vamped relay. The current drawn by the relay circuit is less than 10 milliamperes. The two relays used to assemble the changeover relay unit are easily and inexpensively obtained on the surplus market.

The antenna output is brought to a coaxial fitting on the top of the cabinet. A dipole, ground plane, or "J" antenna may be mounted directly on the equipment or a 52-ohm coaxial transmission line may be used to feed a remote directional antenna.

The receiver is aligned in the conventional manner, using a signal generator or test oscillator for the i.f. amplifier and another receiver or a v.h.f. signal generator for the oscillator and for dial calibration. In aligning the r.f. stage,  $C_1$  is adjusted for peak output of the stage. After initial setting it may be locked in position.

The transmitter should be tuned up with the aid of a grid dip oscillator, although an accurate wavemeter incorporating a sensitive meter will give satisfactory results. First, the grid dip oscillator or wavemeter is tuned to approximately 24 megacycles and placed near  $L_{\pi}$ , the plate coil of the 6J6 harmonic oscillator. Condenser  $C_{\pi}$  is then tuned for maximum reading on the test instrument. The test instrument is then tuned to 48 megacycles and held close to  $L_{\pi}$  and  $C_{\pi}$  tuned for maximum reading. The test meter is then tuned to the multiple of the fundamental frequency which falls within the two-meter band. It is then placed near the plate coil  $L_{\pi}$  of the 6J6 frequency tripler and the plate condenser  $C_{\pi}$  is tuned for maximum reading on the meter. With the test instrument dial setting unchanged, the

final r.f. amplifier is tuned for maximum output by placing the meter close to  $L_{\pi}$  and tuning  $C_{\pi}$ . Care should be exercised in tuning the final amplifier as a sensitive meter might easily be damaged due to the r.f. power radiated by the amplifier. It is better to start several inches from the final tank coil and move closer until a satisfactory working reading is obtained. If any stage approaches resonance, as indicated on the test instrument with the tank condenser of the stage completely unmeshed, it is an indication that the circuit contains an excess of inductance. The coil should be slightly stretched until it is possible to attain resonance with the condenser approximately half-meshed. Conversely, if resonance is approached with the tank condenser completely meshed, it is an indication of insufficient inductance. The coil should then be slightly compressed so that resonance will occur with the condenser approximately half-meshed.

As previously stated, the final 6J6 r.f. amplifier is neutralized by two-inch lengths of 72-ohm twin-lead placed in the circuit as the  $C_{\pi}$  and  $C_{\pi}$  neutralizing condensers. Neutralizing procedure is as follows: With the plate and filament voltages to the 6J6 final amplifier applied, and with the 6J6 frequency tripler removed from its socket so that no excitation is applied to the grid of the final, place the test instrument, tuned to the output frequency, close to the final tank coil. Upon tuning  $C_{\pi}$  through its range, there will appear, at some point in its tuning range, a reading on the meter. The two lengths of 72-ohm line should be carefully pruned, one-eighth inch at a time, until no reading appears on the test instrument. The stage is now completely neutralized, and there should be no indication on the meter, no matter where the tuning condenser is turned. Neutralization should occur when the pieces of 72-ohm line are approximately 1½ inches long.

-30-

# Methods of Developing Sweep and Marker GENERATOR SIGNALS

By  
**CYRIL H. BROWN**  
Kay Electric Company



Over-all views of the "Mega-Sweep" (left) and the Model LF, "Marka-Sweep" (right), both manufactured by Kay Electric Co. of Pine Brook, New Jersey.

## *Details on some of the most common techniques used to obtain sweep and marker frequencies.*

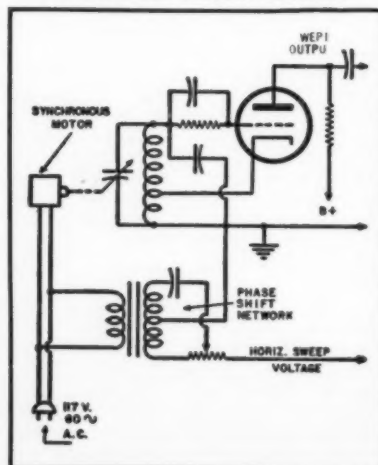
**T**HE use of broadband amplifier systems in television and radar has encouraged the development of a series of instruments especially applicable to the alignment of such amplifiers. The r.f. sweep generator, a laboratory tool only a few years ago, has become a necessity on the workbench of every television technician, along with the voltmeter, the single frequency c.w. signal generator, and the oscilloscope.

Many different methods of causing the frequency to vary through the desired range have been devised. Probably the earliest of these is illustrated in Fig. 1. In this system the frequency sweep is provided by a motor-driven variable capacitor connected across the tuning capacitance of a conventional LC tuned r.f. oscillator. Usually the plates of the rotating condenser are so shaped as to provide a sinusoidal variation of frequency, and motor speed is selected so that frequency modulation is at the power line frequency. The horizontal axis of the oscilloscope is usually driven by a 60 cycle sine wave derived from the power line through a variable phase shift network. This phase shifter is necessary to allow proper overlap of the two amplifier response curves on the oscilloscope screen. A response curve is drawn out separately for each positive and negative frequency change. The phasing network allows moving of these two patterns relative to each other until they are superimposed. This sweep generator system suffers

from an obvious disadvantage, since a motor driven condenser must operate at all times while the sweep generator is in use. Contact and bearing difficulties have held the maintenance cost of such instruments at a comparatively high level.

A great improvement on the basic motor driven system was made when the rotating motor was replaced with a moving coil (in magnetic field) similar to the PM loudspeaker mechanism. This system, still extensively used, is less expensive to maintain than its predecessor, but still requires the use

Fig. 1. Sweep signal generator using a motor-driven variable condenser.



of phasing networks for proper picture adjustment.

The first of the all electronic sweep generators was the *Kay Electric Company* "Mega-Sweep," a schematic diagram of which is shown in Fig. 2. This instrument uses two 723A/B klystrons working in the 10,000 megacycle frequency range in a beat frequency system. One klystron is operated at a fixed frequency, while the frequency of the other may be varied up to 1000 megacycles away from the fixed oscillator by adjusting the front panel controls of cavity tuning and repeller voltage. The variable frequency oscillator is also swept in frequency by the application of a saw-tooth oscillator signal in series with the repeller voltage supply. The r.f. output of the klystrons is fed through an assembly of  $\frac{3}{4}$ " x  $1\frac{1}{2}$ " waveguide which consists of a waveguide section for each klystron, resistor card waveguide terminations and attenuators, and a directional coupler to get both klystron signals into one waveguide. The mixer is a 1N23B crystal detector inserted into the waveguide, and connected directly to the output terminals through a very short bus wire. Frequency adjustment and measurement is done by means of a very accurate coaxial wavemeter which is coupled into the waveguide system. The use of the extremely high frequency for the individual oscillators as well as the waveguide distribution system assures the user that none of the individual oscillator signal will appear in the output.

The all electronic sweep generator has a great advantage in that its internally generated sweep saw-tooth may be synchronized to the power line frequency or varied in frequency to allow easy detection of hum in the circuit under test. The greatest feature of the "Mega-Sweep" system, how-

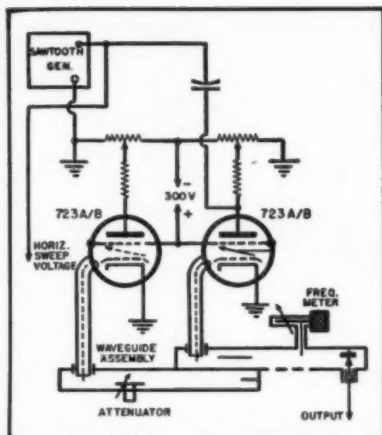


Fig. 2. Wiring diagram of the "Mega-Sweep."

ever, lies in its ability to tune between 50 kilocycles and 1000 megacycles as well as to vary its sweep width continuously between zero and 30 megacycles. Automatically perfect sweep synchronization and adjustment of the oscillograph picture is obtained by sweeping the oscillograph beam with the same saw-tooth voltage that sweeps the oscillator frequency. Although newer sweeping methods have been devised, none has yet proved as versatile.

The most promising of the newer sweep systems was first introduced some time ago, but appears in its most refined form in the *Kay "Marka-Sweeps"* and the *"Rada-Sweep."* In this method the sweep is obtained by varying the permeability of the core of the r.f. oscillator coil in accordance with an applied saw-tooth signal. A basic schematic diagram of such a system is shown in Fig. 3. An oscillator circuit configuration of any type may be used, having the frequency determining circuit  $L_1C_1$ . A ferromagnetic core  $P_1$  is inserted into the inductance  $L_2$ , and a conventional transformer lamination stack  $P_2$  is arranged so that its magnetic circuit is closed by the r.f. oscillator core  $P_1$ . The saw-tooth generator applies a signal to magnetizing coil  $L_1$ , the function of which is ultimately to set up a saw-tooth variation of magnetic intensity in the r.f. oscillator coil core  $P_1$ . This variation of magnetic intensity causes a saw-tooth modulation of the permeability of core  $P_1$ , thus modulating the inductance  $L_2$ , and the resonant frequency of circuit  $L_2C_1$ .

This method provides an ideal solution for a production and service alignment instrument for television and radar. Although instruments using this system do not have the great versatility of the klystron beat frequency oscillator, many other advantages are apparent. Conventional vacuum tubes are used throughout. Sweep widths of 15 and 20 megacycles and more are easily attained even at the commonly used intermediate frequencies. Frequency and amplitude linearity are exceptionally good, assuring accurate

reproduction of the response curve.

Of major importance in the use of a sweep signal generator is the availability of accurate and easily readable frequency marks. The simplest and historically earliest type of mark is the so-called "birdie." This mark is produced by feeding the output of a c.w. signal generator to the set under test in parallel with the sweep signal. At the detector of the set the c.w. signal mixes with the sweep signal and produces the audio "birdie" marker on the oscillograph pattern once each sweep cycle, as the swept oscillator frequency passes through the c.w. oscillator frequency. This birdie marker system suffers from several serious disadvantages:

1. Because of phase variations the birdie marker varies rapidly in amplitude, and is rather difficult to observe;
2. Since a high level c.w. signal is often necessary to produce a mark of visible amplitude on the oscilloscope display, there is always danger of overloading the set under test and thus distorting its true response curve;
3. The birdie mark can not be used satisfactorily to align trap circuits, since the c.w. signal must be set to the trap frequency; the c.w. signal is thus absorbed in the trap, and is not present in the output to produce the mark.

The second type of mark in common use is a pulse type marker which collapses the displayed pattern to zero at the marker frequencies as indicated in Figs. 4A and 4B. To obtain this mark, a birdie signal similar to that described previously is usually developed in the generator. The birdie is detected, shaped, amplified, and finally connected to the sweep oscillator circuit in such a way as to disable the oscillator for a short period of time, causing the r.f. output to drop to zero for an instant. Although the mark is primarily a frequency mark, the circuits perform the function of creating a timed mark, with reference to the horizontal sweep axis. Although a great improvement over the simple birdie mark in that no c.w. signal passes through the

Fig. 3. Sweep generator using permeability modulation of the oscillator core.

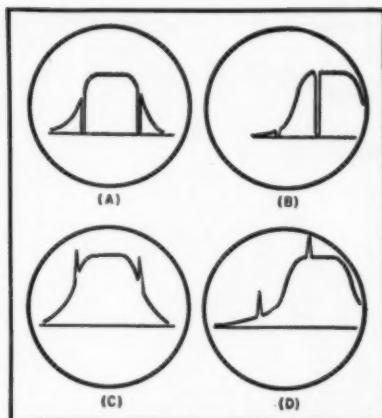
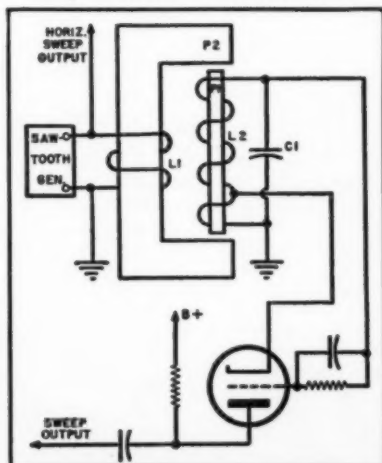


Fig. 4. Patterns illustrate aligned (A) and misaligned (B) amplifier, using a pulse type marker which disables oscillator; aligned (C) and misaligned (D) amplifier using an independent pulse type marker.

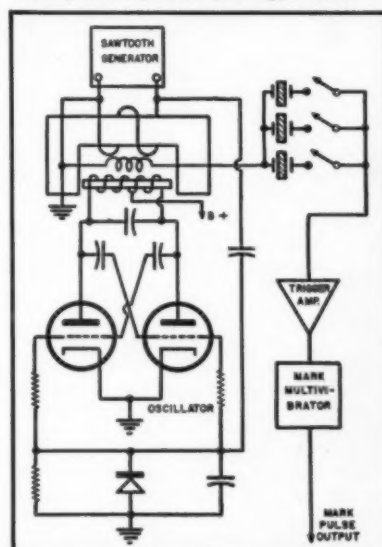


Fig. 5. Diagram of "Marka-Sweep" Model 1F.

device under test and that mark stability and visibility is greatly improved, this marking method does suffer from certain disadvantages:

1. Serious misalignment of the amplifier unit under test can result in inability to see marks.
2. Regeneration and oscillations in the unit under test can obliterate marks.
3. Mark level is not independently adjustable.

The most recent development in marker circuits has resulted in the independent pulse type marker. In this system a series of crystal filters is connected to the output of the sweep oscillator. As the sweep oscillator passes through a crystal frequency a small burst of energy is transmitted by the crystal. This signal (a high frequency birdie) is rectified and amplified and triggers a blocked multivibrator, the output of which is fed directly to the vertical terminals of the test oscillo-

(Continued on page 91)





Top view of the modified "FreModyne" receiver. Oscillator coil is mounted on tuning condenser.

# Build This Low-Cost FM RECEIVER

**Construction details on a simple, four-tube FM receiver that anyone can build without special tools or test equipment.**

By  
**JOHN F. CLEMENS,**  
WBGR

**I**F YOU live within 40 miles of an FM station and you are not now enjoying an FM receiver or if you are looking for an interesting and worthwhile small project, you should build this four-tube FM receiver. It is simple enough to be attempted by the beginner in radio and the performance will make it an attractive project for the veteran radio builder. The construction of the average FM receiver, a maze of ever-oscillating i.f. stages and cantankerous discriminators, is a job which may well cause the home constructor to pause. But this simplified circuit eliminates most of the critical adjustments and the gain in any one part of the receiver is too low to give oscillation troubles. If the coil specifications are followed closely there is no reason why this set cannot be built and put into operation without test equipment of any sort.

The basic circuit is an outgrowth of the "FreModyne" which was described in February, 1948 issue of RADIO NEWS. Several "FreModynes" were built and, despite the fact that the complicated circuitry defied our understanding, the results were excellent. It appeared that a less complex circuit should accomplish the same results and save parts as well. The circuit which resulted from considerable experimentation has achieved this reduction in components at no sacrifice in performance. As a result, the set is less costly to build than the original "FreModyne." An a.c.-d.c. power supply is used to save space and money by elimination of the power transformer, and at the same time, the one usual disadvantage of the a.c.-d.c. supply, a chassis "hot" with 110 volts, has been avoided. A metal cabinet is safe and practical.

Although this set is constructed in a 4x5x6 inch utility box without undue

crowding, it may be desirable to use a slightly larger box, say 9x5x6, especially if a larger speaker is used. The 2x3 oval speaker shown is not necessarily the best choice for the job since it has poorer quality and efficiency than larger speakers, but it is about the largest size that can be easily fitted into the cabinet. A 4x4 PM speaker is recommended as somewhat superior and it can be most easily fitted into the larger size utility box. For those who do not have facilities to bend a chassis, a line of utility boxes is available from ICA which include the chassis.

The circuit uses one half of a 12AT7 as combination mixer and superregenerative detector at 21.75 mc. The FM signal is introduced into the mixer grid circuit along with the local oscillator signal by coupling the antenna to  $L_1$ , which is resonant with the tube and circuit capacity at 100 mc. It has been determined experimentally that there is no practical advantage in tuning this coil with the tuning condenser, so the added expense of a two-gang tuning condenser is avoided. To obtain the proper "Q" in the 21.75 mc. slug-tuned coil ( $L_1$ ) for good slope detection of FM broadcast stations some loading of the coil is necessary. In the original "FreModyne" a resistor was connected directly across the coil to give this loading. In this version, the detector plate load resistor provides the required loading and thus dispenses with one component. Similarly, in the original circuit a Colpitts oscillator circuit was used with a pair of condensers providing the cathode tap on the tuned circuit, while in this circuit the coil is tapped, saving one condenser. Other parts which have been eliminated are two r.f. chokes, a decoupling resistor and bypass condenser, and an 8  $\mu$ fd. electrolytic condenser.

The circuit has been arranged to use the second half of the 12AT7 as the audio stage rather than the more usual connection of this section acting as the local oscillator, to derive the benefit of the high gain of the 12AT7 as an audio amplifier. As a result, the audio gain of the first audio amplifier is sufficient without a cathode bypass condenser, a further saving.

The local oscillator is a 6C4, tuning from 66 to 87 mc., to beat with the incoming FM signal to produce the intermediate frequency of 21.75 mc. A ceramic socket should be used for the 6C4 to insure strong oscillation, although the other tube sockets may be of bakelite or any other type.

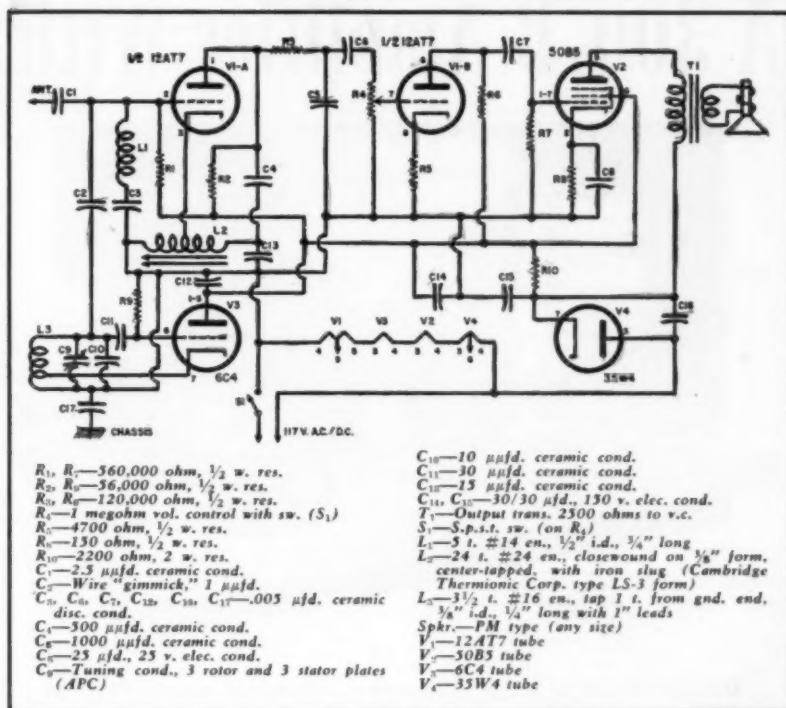
A 50B5 audio output tube drives the output transformer and PM speaker to good room volume and a 35W4 is used as rectifier. During the development of the circuit, a severe hum occurred as a modulation on all received signals, completely defying filter and bypass condensers. It was finally discovered that a .005  $\mu$ fd. bypass condenser ( $C_1$ ) across the rectifier eliminated the hum. There is no apparent reason for the requirement of this condenser; just another example of how a.c.-d.c. receiver design is still as much art as science. A resistance-capacity filter gives adequate filter action provided the filter condensers are sufficiently large. Thirty microfarads per section or more is adequate and a condenser can be obtained which includes a 25  $\mu$ fd., 25 volt section for use as  $C_2$ . The output transformer should be chosen to match the 50B5 (2500 ohms) to the voice coil of the speaker used, usually 4 ohms.

The only critical aspects of the construction are in duplicating the r.f. coils and tuning ranges. If the coil specifications and photographs are followed closely this should present no particular difficulty. The oscillator coil should be wound exactly as shown and mounted on the tuning condenser terminals. The tuning condenser is an APC type, widely available on the surplus market, and has a capacity range of approximately 15  $\mu$ fd. It is important that the .005  $\mu$ fd. condenser,  $C_1$ , be connected from the tuning condens-



er rotor terminal to the metal panel of the receiver right at the rotor terminal, using a soldering lug under one of the screws which mount the tuning condenser, to avoid hand capacity effects and produce the proper tuning range of the oscillator. Another .005  $\mu$ fd. bypass condenser,  $C_{13}$ , should be connected from pin 1 of the oscillator tube socket (the plate of the 6C4) to the negative plate supply lead with short connections.  $L_2$ , the superregenerative detector coil, is wound on a  $\frac{3}{8}$  inch diameter form with an iron slug. A suitable form is a *Cambridge Thermionic Corp.* type LS-3. This coil is tuned to 21.75 mc. so that the fourth and fifth harmonics of the superregenerative detector fall just below and above the FM band, respectively, and do not fall in the tuning range of the receiver where they would otherwise appear as spurious responses. The signal input coil,  $L_1$ , may be adjusted slightly by squeezing or spreading the turns and checking with a grid-dip oscillator to set the resonant frequency to 100 mc., but the improvement in performance due to this refinement is so small that it may be ignored if no grid-dip oscillator is available. The tuning of this coil is so broad that there is no need to worry about slight imperfections in it. It would be wise also, to wire the heater string in the sequence shown on the diagram, otherwise hum may be introduced.

Other parts of the circuit are definitely non-critical. The values of resistance and capacity shown are the actual values used in this set, but wide latitude is permissible if the junk box is better stocked with other values. For instance, the 56,000 ohm resistors in the circuit could just as well be replaced with 47,000 or 68,000 ohm units without noticeable effect. Any of the new ceramic bypass condensers, either tubular or disc types, are excellent for construction such as this, and are highly recommended. They are smaller than the old tubular paper condensers and have lower leakage and lower lead inductance. The oscillator signal is injected into the mixer grid by means of a "gimmick,"



Complete circuit diagram of the simple, four-tube FM receiver.

a short piece of hookup wire soldered to the grid end of  $L_1$  and wrapped one turn around the oscillator lead as shown. This capacity is not at all critical.

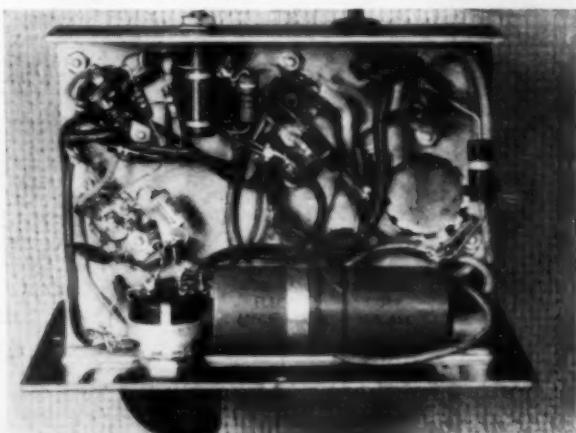
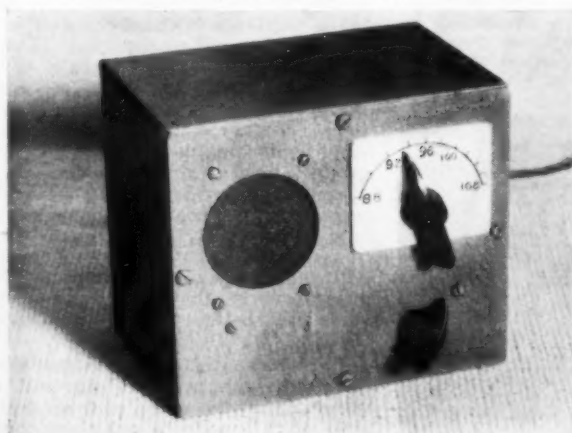
A small aluminum rectangle was used for the dial plate and the frequency calibration was engraved on it with a *Burgess "Vibra-Tool."* A more elaborate dial would improve the appearance but a bar knob is quite satisfactory for easy tuning. A coat of blue wrinkle paint was sprayed on the entire cabinet to produce the finished product.

The sensitivity of the four-tube receiver is truly amazing. FM stations 40 miles away are received consistently with good, useful signals. In fact, the set receives any signal that

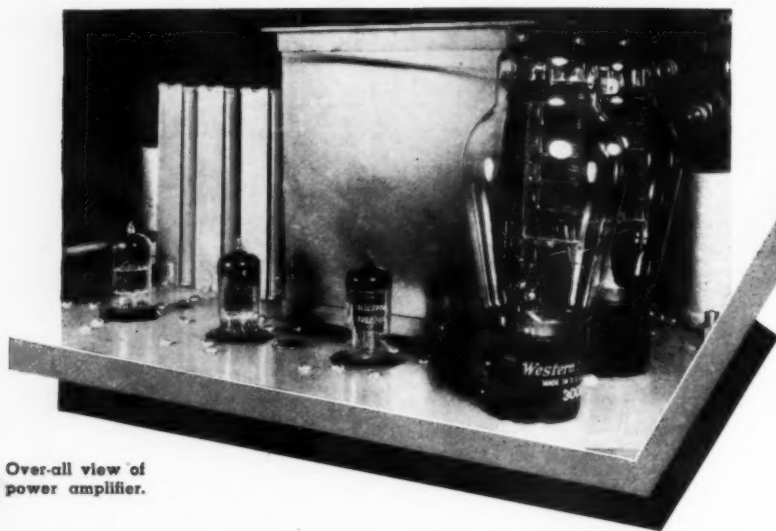
produces a useful signal in a full-grown, twelve-tube conventional FM set. Two or three feet of wire is an adequate antenna, and the antenna terminal may be connected to the power line if desired with practically the same results as a separate antenna. Local and distant stations are of practically the same strength, due to the inherent limiting action of the superregenerative detector. The only disadvantage of this circuit is the interstation rush, a drawback which it has in common with all superregenerative circuits. Since the rush quiets when a station is tuned in, this is not a serious failing. The receiver is guaranteed to be well worth the small cost in money and effort required to build it—try it and see!

Front view of receiver as built into a 4 x 5 x 6-inch box.

Underchassis view of set. Leads must be short and direct.



# A 300-B Amplifier With FEEDBACK DRIVER



Over-all view of power amplifier.

***Design details on a five-tube, 30 watt amplifier. A rather unusual circuit provides 70 db of feedback.***

**I**N ANY amplifier using low-mu triodes, large amounts of driving voltage are required. The answer to the problem of drive will usually be the key to the success of any particular design. The time-tested technique, in the past, has been to drop in a good input transformer, drive it from a low-mu triode, and hope for the best.

Unfortunately, most discriminating engineers have become unwilling to accept an amplifier design which does not incorporate a fairly large amount of over-all feedback; 20 db is not excessive. This feedback is usually taken from the output transformer secondary to some early point in the drive system. It is virtually impossible to include a second transformer in such a loop and hope for stable operation.

The desirability of feedback of this nature is virtually unquestioned. Without feedback, a 6AS7 may deliver ten watts at nearly ten per-cent distortion; 300-B's will deliver 30 watts at about 5 per-cent. This distortion is much too high by modern standards; 20 db of properly applied feedback will reduce these figures by a factor of ten. Feedback will also considerably improve the damping, which is already good, in a triode amplifier. It is interesting to note in this connection that while most amplifier design engineers strive for even better damping, some of the foremost loudspeaker specialists will recommend a damping factor on the order of 2. Even this is not incompatible with the use of large amounts of feedback. Current feedback, taken from the voice coil circuit, may be used in conjunction with

voltage feedback to provide any desired damping. The distortion remains a function of the total feedback.

There are other drawbacks to the use of input transformers. Few transformers afford smooth response in the region above audibility, which is becoming a consideration in modern design, and any transformer will introduce some low frequency distortion.

If we eliminate the input transformer from consideration, we pretty well have to fall back on some sort of resistance-coupled driver. With self bias in the power stage we can tolerate grid resistances on the order of 250,000 ohms. A 6J5 (or 6SN7) with a supply voltage of 400, will deliver about 100 volts peak with distortion on the order of five per-cent. While this is largely even harmonic distortion, and would

Fig. 1. (A) Square wave performance of the amplifier at 5 kc. (B) Square wave performance at 20 cycles shows excellent low frequency response. These oscillographs were taken at a power level of ten watts.



By

**HOWARD T. STERLING**

Pres., Waveforms, Inc.

be cancelled in the plate circuit of the output stage, it nevertheless indicates non-linearity and the probability of intermodulation in the driver itself. Furthermore, this is only as much drive as low-mu tubes may require, and offers no margin of safety.

The obvious solution is to use feedback over the driver. The feedback pair, which has received altogether too little recognition as such in the audio field, is entirely suitable for this application. Fig. 2 shows the circuit of an experimental 30-watt amplifier using 300-B's, for which the feedback driver was developed. In this circuit, initial phase inversion was achieved in a long-tailed pair, such that the resulting unbalance was about 10 per-cent. This is followed by the feedback driver, which consists of two feedback pairs in push-pull, with direct-coupled feedback to minimize low frequency phase shift. The feedback configuration is such that it provides differential balance, and hence effectively eliminates any residual unbalance appearing at the 300-B grids. The only critical elements are the resistors in the feedback circuit, but now that the stable 1 per-cent tolerance English resistors are available at low cost in this country, this presents no problem.

The tube used for the driver in this circuit was the 12AT7. A 6SN7 would have been satisfactory, but the higher mu of the 12AT7 allows more gain within the feedback loop, while its low plate resistance keeps the source impedance low. Actually, the 12AT7 combines most of the virtues of both the high mu and low mu types, and is excellent for general audio applications. Some tube engineers have advised against its use for audio on the grounds that since the grid is very close to the cathode the tube should be very microphonic. Compensatory care is apparently taken in assembly, however, since it compares favorably with other types in this respect. Its appearance is admittedly a little odd when used beside the relatively huge 300-B's.

From this circuit there is available about 140 volts peak per grid with a distortion on the order of 1 per-cent, more than enough to drive any tube

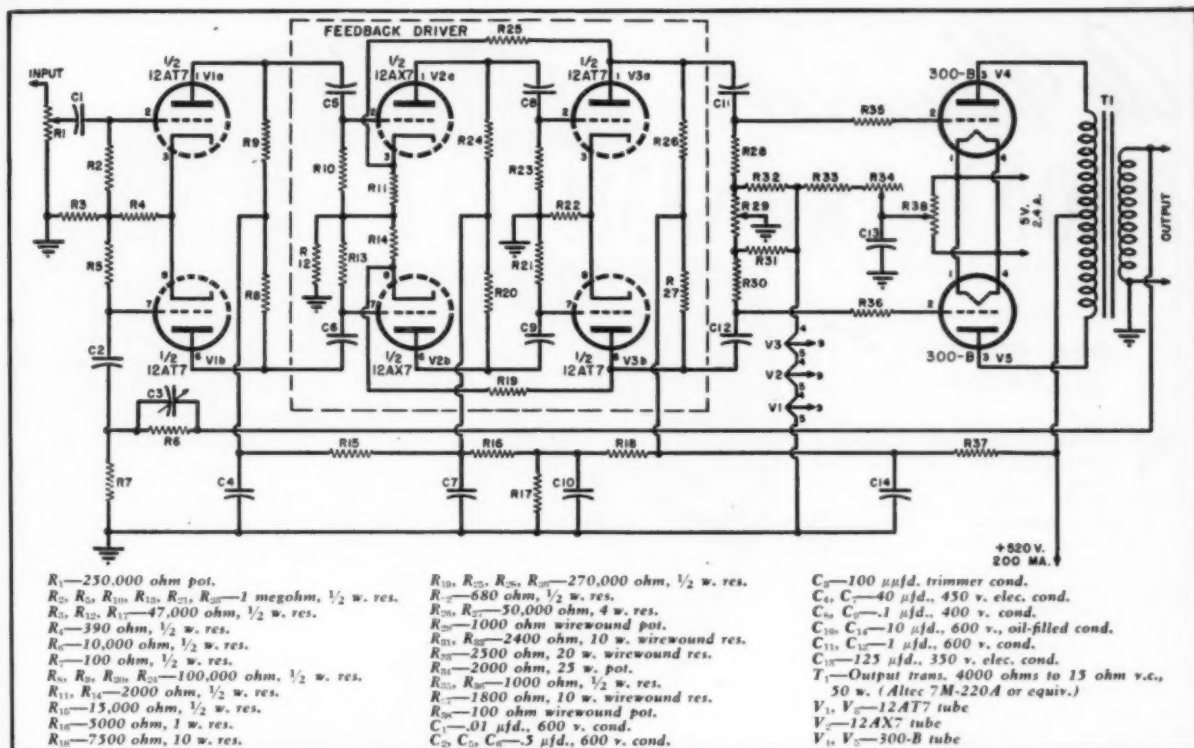


Fig. 2. Diagram of power amplifier with feedback driver section shown in dotted lines. Any power supply, having an output of 520 volts at 200 milliamperes, can be used. Actually, on this unit, some of the power supply metering and control circuits were incorporated on the same chassis as the amplifier. The transformer,  $T_1$ , as used had a split primary. This, of course, is not absolutely necessary. It does, however, provide a simple means of balancing the output stages. The author incorporated two closed circuit jacks in the center-tap legs of the primary windings in order to simplify plate current measurement. These jacks can be seen in the upper right hand corner of the photograph below.

in general use. With suitable precautions, any residual unbalance will be on the order of 1 per-cent or less, which will be negligible compared with the dynamic unbalance of any but a very carefully matched pair of power tubes.

The off grid of the input long-tailed pair provides a very convenient point for the introduction of inverse feedback. Some 20 db of feedback was used over the four stages of this amplifier, including the output transformer. This, together with an estimated 50 db in some four feedback circuits within the amplifier, gives us a system with five loops and a total of some 70 db of inverse feedback.

The application of over-all feedback in an amplifier of this type poses a number of problems. It is extremely important to insure that the use of feedback does not result in instability at either of the frequency extremes.

At low frequencies, this instability might appear as a continuous oscillation (or motorboating) at a fraction of a cycle-per-second. If the instability were only slight it might be apparent as a few damped cycles of "recovery" following some signal transient.

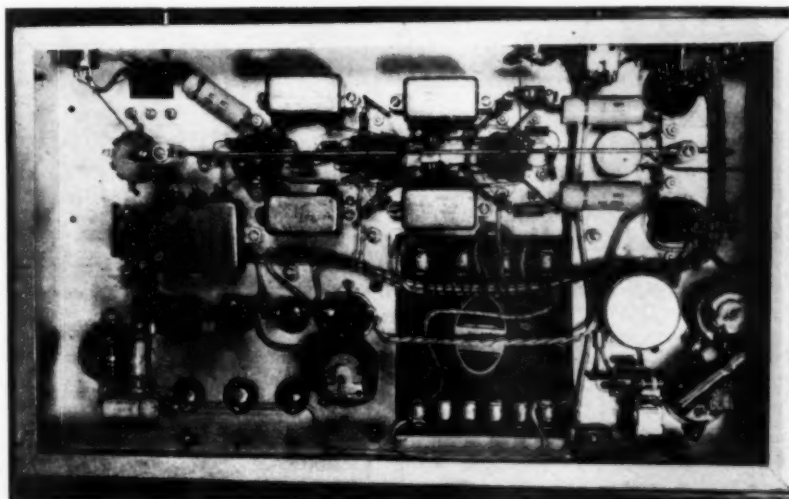
Obviously, this instability is caused by phase shifts within the amplifier which are sufficient to make the normally inverse feedback positive, or regenerative. These phase shifts are due, at low frequencies, both to the output transformer and to the coupling

condensers. Since the output transformer characteristic is fixed, the best solution is to keep the phase response of the rest of the amplifier flat until the low frequency loss in the transformer has reduced the loop gain to the point where the system can no longer take off. This calls for the use

of large time constants in the coupling circuits, and for as few such coupling circuits as possible, since there can be a considerable accumulated phase shift before any serious effect on response becomes apparent.

It is normally easy to maintain low  
(Continued on page 113)

Bottom view of the five-tube power amplifier. As mentioned previously, the power supply was constructed on the same chassis as the amplifier. The two relays shown at the bottom of the photograph are connected in the power supply circuit and are used as a means of operating the power amplifier from a remote position.





# An Unusual PHONE TRANSMITTER

By  
**BOB PERTHEL,**  
W9MWD

**N**UMEROUS methods of modulation have been devised, but good old AM seems to be preferred by the majority of hams. By using the system to be described AM can be obtained without the use of large modulators and the final tubes operate class C at I.C.A.S. ratings. All of the advantages of low level modulation and a greater over-all efficiency than that of conventional plate modulation are realized.

This system makes use of the fact that when two waves of the same frequency, but differing in phase, are mixed, amplitude variations are produced. In Fig. 2 the waves marked *a* and *b* are equal in amplitude, frequency, and phase. When they are added a wave differing only in amplitude equal to the sum of the waves at *a* and *b* is produced. However, when *a* and *c*, both of equal amplitude and frequency but 180° out-of-phase, are added a complete cancellation results.

It should now be understood that when two waves of the same frequency and amplitude, but differing in phase, are mixed the end result can be anywhere between the two limits described.

If a phase modulated wave and an

Fig. 2. Theoretical analysis of wave addition. See text for detailed explanation.

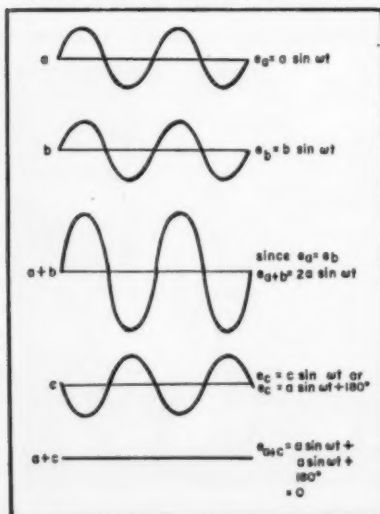


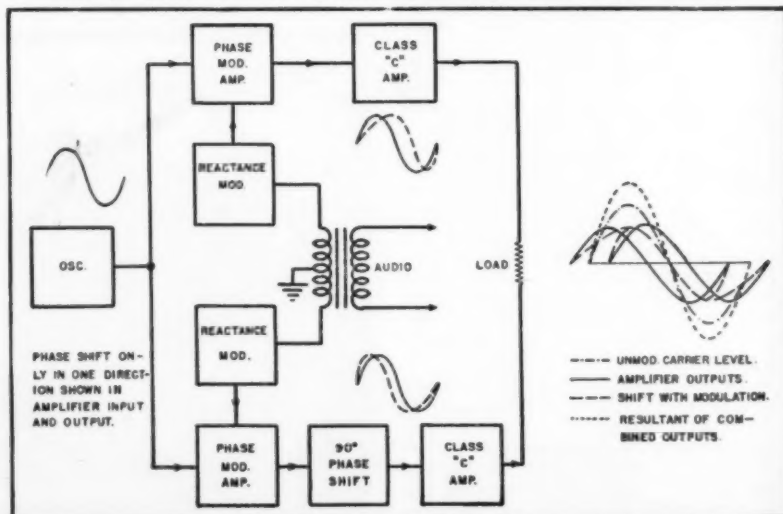
Fig. 1. Over-all view of transmitter. For parts identification see Fig. 4.

*Transmitter described was designed as a mobile unit for the 75 meter band but with a few changes it can be used as an exciter for a 1 kw. final amplifier. It employs an unusual phase modulated AM system widely used by European radio stations.*

unmodulated wave are mixed, amplitude modulation will be produced but one-half the phase change and consequent frequency change will still be present. This phase change can be made to cancel by phase modulating

both waves so that one will lead while the other is lagging. Effectively, then, the frequency of one will be increasing and the other decreasing with the net result that there is no change in frequency. If two oppositely modu-

Fig. 3. Diagrammatic representation showing how two waves of same frequency, but differing in phase, are mixed to produce amplitude modulation. See text for analysis.





lated waves are combined 90° out-of-phase, the waveform desired for 100% AM modulation is produced. See Fig. 3.

Figs. 1 and 4 show the transmitter at W9MWD. It was designed for use in the 75 meter band as a mobile unit or, with slight change, as an exciter for a kilowatt final amplifier. It is built on a 7 x 13 x 2 inch chassis and no "trick" or hard-to-reach operating circuits were used. The oscillator is a conventional triode oscillator, using one-half of a 2C51. This tube is a twin triode of the miniature type and could be replaced by a 7F8 or two miniature triodes such as 6C4's. It drives two 6AK6 pentode amplifiers in parallel. The circuit constants permit class C operation of these tubes. The 6AK6's have their plate circuits tuned separately. Center-tapped coils were found desirable in these stages, but neutralization wasn't found necessary. A pair of 2E26's was selected as the output tubes as they require very little drive for full output and, as a consequence, do not lower the "Q" of the 6AK6 tank circuits excessively. Driving the two 2E26's 90° out-of-phase is done quite simply by using direct coupling for one tube and inductive coupling for the other. An initial adjustment in the coupling between  $L_2$  and  $L_3$  is necessary, but not critical. The coupling should be adjusted close enough so that the individual outputs of the 2E26's are as nearly equal as possible. Excessive coupling will cause "twin peaks" in the tuning of  $C_{11}$  and ruin the operation of the whole unit.

The outputs of both 2E26's are combined push-pull in a single tank circuit ( $L_5$ ,  $C_{20}$ ). Experiment indicates that parallel operation leads to difficulties in securing the proper phase relationship necessary for correct operation of this system. A tendency toward instability in the 2E26's was corrected with small carbon resistors in grid and plate leads. These resistors were installed only where required.

The only precaution that should be taken in the construction of this unit, and one that is not common to all exciters, is that reasonable care should be taken so that the outputs of the 6AK6's are not combined through stray coupling in the wiring. If these outputs are coupled in any way amplitude modulation of the drive to the 2E26's will result, causing distortion. The oscillator and the two 6AK6 tank coils were placed at right angles and all wiring associated with the 6AK6 plate and 2E26 grid circuits was separated as much as possible.

The coil forms and variable condensers in the unit pictured were salvaged from BC-610 tuning units, since they were well adapted to the purpose.

As an exciter for a pair of 813's it is necessary to tune the 2E26's separately and drive each 813 individually. The 813 outputs are then combined in push-pull. See Fig. 5.

This system of modulation is entirely flexible. It is possible to double in any stage without affecting the modulation (we tried it). It is also possible

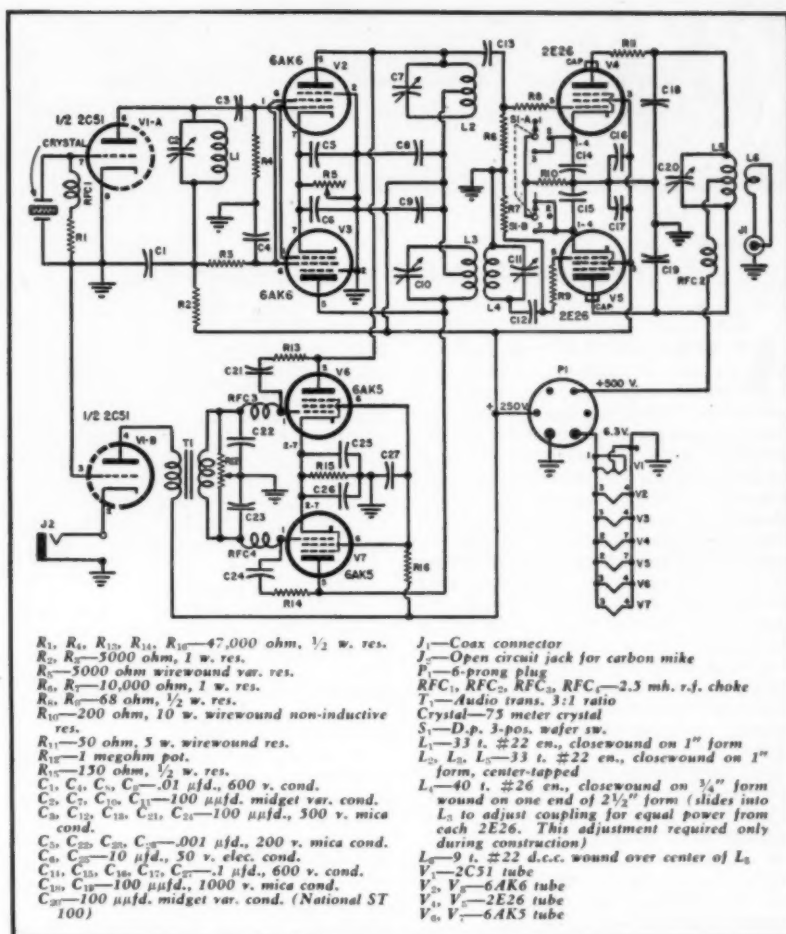


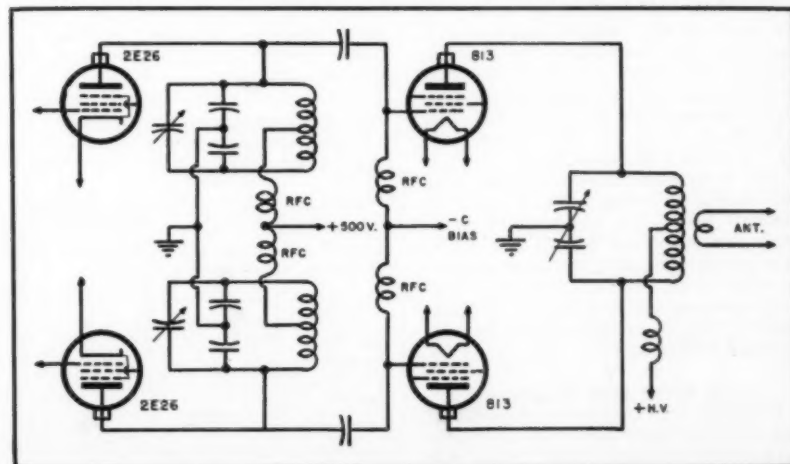
Fig. 4. Complete schematic diagram and parts list for the phone transmitter.

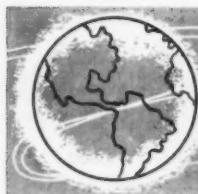
to feed the output of an e.c.o. into the crystal stage, but careful peaking of each stage is necessary if the frequency is moved more than a few kilocycles.

The tuning procedure is simplicity itself. First disconnect the microphone and connect a 25 watt lamp to the an-

tenna connector, then throw the 2E26 cathode switch to position 1 and tune  $C_5, C_{10}, C_{11}$ , and  $C_{20}$  for peak output. A milliammeter in the 2E26 plate circuit would be dipped in the usual manner by  $C_{20}$ . Then throw the switch to position 2 and tune  $C_7$  for peak output. (Continued on page 76)

Fig. 5. How the unit described can be used as an exciter for a high power amplifier.

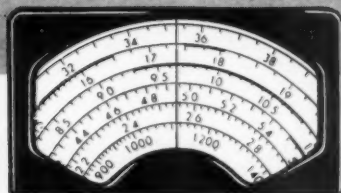




# International

# SHORT-WAVE

Compiled by KENNETH R. BOORD



**A**T THE time this was written, *Radio Peking* was presenting prisoner-of-war messages (voiced by United Nations soldiers captured in Korea) at approximately 0445 and 1715 over one or more of these channels—15.17, 15.060V, 11.685 (announced 11.690), 10.260, and 6.100. (Anyone picking up such messages—where addresses of relatives are given—should forward them promptly. Most are of a propaganda nature and it is believed the POW's are "forced" to read them; but at least, it may let "homefolks" know that the serviceman is a POW, and not merely "missing." Also, please be on the lookout for POW messages from Communist outlets in addition to *Radio Peking*. Thanks!—KRB)

The New Zealand Radio DX League has been doing some wonderful work in monitoring *Radio Peking* and then relaying POW messages. Towards the end of May, the League had already handled upwards of 1000 names. Arthur T. Cushen, an official of the League, writes me:

"The New Zealand Radio DX League, with members interested in short-wave radio reception, feels it can help the many friends of the United Nations by providing this service. These messages are compiled from the reports of many listeners. During World War II, the League handled some 6000 names, and in this present conflict has sent many hundreds of names forward to the representatives of the interested countries, located in the Dominion of New Zealand. In the case of 'personal' messages, these have been forwarded to the next of kin, where possible, and we know how much they are appreciated, as they often have been the first news about men missing for months. Many messages are being handled daily—many of them the first news since last October and November."

It is a pleasure to dedicate the *ISW DEPARTMENT* this month to the New Zealand Radio DX League, its members, and all other SWL's the world over who are doing such splendid work in monitoring POW broadcasts and then relaying the messages to "homefolks!" This is a commendable service to their fellowmen!

### Visit With ISW Monitors

Recently, on a trip to the West Coast and through the South, your *ISW DEPARTMENT* editor made many fine

contacts with both veteran and newer monitors—including Paul Dilg, August Balbi, Frank Winch, Carl B. Rosenauer, J. Art Russell, Harold Stein, California; Jack Slattery, John Callarman, Oregon; Ramon Stark, Texas; Bill Fargo, Georgia; Grady C. Ferguson, North Carolina, and others. Sorry time would not permit contacts with even more!—KRB.

### Club Notes

**Sweden**—Bertil Thorner has given up his duties as editor of *GDX-aren*, house organ of the Göteborgs DX-Klubb, and the new editor is Harry Ericsson, Volvat Thamskatan 5a, Göteborg, Sweden. Thorner will remain as secretary of the group.

**USA**—The Newark News Radio Club held its annual convention-outing at Mapine Farm, Moyers Road, Lansdale, Pennsylvania, Sunday, June 24. Hosts were Harold Robinson, one of NNRC's vice-presidents, and Mrs. Robinson. The club recently chose these officers for the coming year—Irrving R. Potts, president; Walter L. Townley, treasurer; Albert J. Sauerbier, executive secretary; Benjamin Feinstein, assistant executive secretary; Peter J. McKenna, Lester W. Kraemer, Henry T. Tyndall, John W. Reichert, Charles S. Sutton, Abe Cohen, Louis Hahn, Charles P. Atherton, Harold Robinson, Roger Legge, Le Roy Waite, Jack D. Rhea, vice-presidents; and G. Dudley Clarke, Canadian vice-president. The editorial staff includes Mr. Potts, editor; Carroll H. Weyrich, Frank Pytlak, Charles R. Conley, broadcast band; Henry and Amelia Bennett, short-wave; Sheldon Dunham, Stephen A. Mann, amateur; and Carleton Lord, special features.

### This Month's Schedules

**Andorra**—*Radio Andorra* noted in Scotland on 5.995 at 1600-1630. (Rodger)

**Angola**—*Radio Clube de Benguela*, CR6RB, noted on 9.165 at 1345 and to sign-off 1401 with "A Portuguesa"; bad CWQRM. (Pearce, England)

(Note: Unless otherwise indicated, all time is expressed in American EST: add 5 hours for GCT. "News" refers to newscasts in the English language. In order to avoid confusion, the 24 hour clock has been used in designating the times of broadcasts. The hours from midnight until noon are shown as 0000 to 1200 while from 1 p.m. to midnight are shown as 1300 to 2400.) The symbol "V" following a listed frequency indicates "varying." The station may operate either above or below the frequency given. "A" means frequency is approximate.

**Argentina**—SIRA, Buenos Aires, is now using 17.72 with *English* around 1400-1630; call is LRA. (Serrano, Brazil) This one noted in Delaware with talk in *English* 1300-1318. (Cox) Heard on this channel with news in Spanish 1043. (Dyrekter, Brazil)

**Australia**—*Radio Australia* now is using new suffixes—the numeral following the transmitter call-sign now indicates the megacycles band in use; the same suffix is used for any frequency in a particular band; examples, VLA15 any frequency in the 15-mc. band; VLA9 any frequency in the 9-mc. band; VLB21 any frequency in the 21-mc. band, and so on. Recent alternations to schedules include 0328-0450, VLB11, 11.85, to Forces in Japan; 0328-0645, VLC15, 15.320, to S. and S.E. Asia; 0328-0855, VLA9, 9.580, to Forces in Japan; 0359-0700, VLG11, 11.880, to China and N. Pacific; 0500-0945, VLB11, 11.850, to S. and S.E. Asia; 0700-1115, VLC11, 11.810, to North America; 0715-0830 (to 0900 Sats.), VLG9, 9.540, to S.E. Asia; 0900-1115, VLA9, 9.580, to S. Asia and Middle East; 1000-1115, VLB9, 9.560, to Africa. (Radio Australia via Stark, Texas)

**Belgian Congo**—After trying various channels—including (announced) 9.745 and 9.800—at the time this was written, OTC2, Leopoldville, was back on its usual 9.767 spot with the usual interference! (Kinge, N.Y., others) Catch, England, says lately he has noted OTH, Leopoldville, rather consistently on (measured) 9.216, good level around 1300; old schedule was 1230-1330 but now is heard as late as 1400 some days.

OTM2, 9.400, Leopoldville, noted with strong level from 0000 sign-on; news in French at start. (Cox, Dela.) After 18 months, a card has been received from OQ2AC, *Radio College*; QRA is *College St. Francois de Sales*. Elizabeth, Congo Belge; frequencies are 7.200, 4.980, 3.390, all 250 watts, scheduled 0200-0400, 1130-1230. (Hannaford, Sou. Afr.)

**Bolivia**—Serrano, Brazil, reports as a new station, Potosi, approximately 6.265, heard from around 1900 to after 2145 in Spanish.

**Brazil**—*Radio Nacional*, Rio de Janeiro, has a new schedule of 0400-1200, 9.72; 1200-1515, 6.147; 1515-1700, 9.72; 1700-2305, 6.147; asks for reports especially on last period of broadcast. The "Agencia Nacional" news program is (Continued on page 108)

# The PULSE-FORMER

By  
LOUIS E. GARNER, JR.

Fig. 1. Over-all view of the "Pulse-Former."



**Basically—a simple series-diode clipper is used to form narrow pulses from an applied sine wave.**

A UNIQUE one-tube device that will form narrow pulses from an applied sine-wave is shown in Fig. 1. Its small size (4"x5"x6") is apparent from the photograph and, as the size implies, its circuit is quite simple, only one control ("Pulse Width") being required.

To obtain pulses, an unsymmetrical series-diode clipper is employed. The series-diode clipper has been previously described as a generator of square waves.<sup>1</sup> To understand the operation of the circuit as a device for forming pulses, it is first necessary to review the theory of operation of the series-diode clipper in its basic form, as shown in Fig. 2.

Diode halves  $D_1$  and  $D_2$  are normally conducting due to the bias voltage supplied by battery  $E$ . Note that the polarity is such that the cathodes of the tube are maintained negative with respect to their plates.  $R_2$  serves as a current limiting resistor and  $R_1$  and  $R_3$ , generally equal in value, serve as the input and output loads. The circuit is perfectly symmetrical in that either side ( $R_1$  or  $R_3$ ) may serve as the input while the other serves as the output.

As long as the diodes are conducting, they act as a closed circuit, permitting any applied signal to appear across the output load. Should the peak voltage signal exceed the battery voltage, one or the other diode will stop conducting and act as an open circuit, thus "clipping" the remainder of the signal. Diode  $D_1$  opens on negative peaks, while diode  $D_2$  opens on positive peaks.

When used as a square-wave generator, the applied peak signal voltage is kept many times higher than the battery voltage so that the clipped signal forms an almost perfect square wave (with a sine wave applied) with a comparatively short rise time, sharp corners, and a flat top.

In the original model,  $R_1$  and  $R_3$  were given a value of 18,000 ohms, while  $R_2$  was 2200 ohms. The circuit worked quite well with a small audio oscillator having a low impedance output. When later tried with a signal source having a medium impedance output, it was found that the resulting "square wave" was unsymmetrical and generally unsatisfactory for conventional square-wave testing.

This unsatisfactory operation was found to be due to the unequal loading existing on positive and negative halves of the applied signal. With  $D_1$  conducting,  $R_1$  and  $R_2$  are essentially in parallel, while on negative peaks, the load on the signal source is represented by  $R_1$  alone. New values for  $R_1$ ,  $R_2$ , and  $R_3$  were suggested to minimize this loading effect.<sup>2</sup> The new

values suggested were 4700 ohms for  $R_1$  and  $R_3$ , and 22,000 ohms for  $R_2$ .

With these values, satisfactory operation of the circuit as a square-wave clipper could be obtained even with comparatively high impedance sine-wave signal sources.

The author decided to carry out additional experimentation with the basic circuit to see if "unsymmetrical clipping" could be put to some useful purpose. Experiments led to the final design of the circuit shown in Fig. 4A. This circuit, when used with a medium impedance sine-wave source having reasonably high amplitude, will supply positive-going pulses, with short rise time, flat tops and "bottoms," and with a variable pulse width (desirable for some types of development work).

To understand the formation of the pulse from a sine wave, refer to Fig. 3. In 3A is shown a "clipped" sine wave, with clipping symmetrical about the zero axis. Note that the tendency is towards the formation of a perfect square wave.

Suppose, now, that the axis is displaced upward, with clipping still symmetrical on either side, as shown in C-D of Fig. 3B. Under such conditions, one "half" of the signal is narrower than the other "half" and a rectangular, rather than a square wave, is formed.

The action of the unsymmetrical clipper is not quite as simple as described, of course, but this serves as a rough approximation of the results obtained with unequal loading on positive and negative halves of the signal. An idea of the degree of change in

Fig. 2

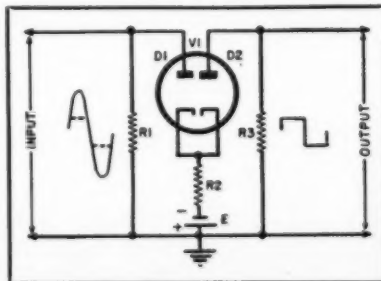
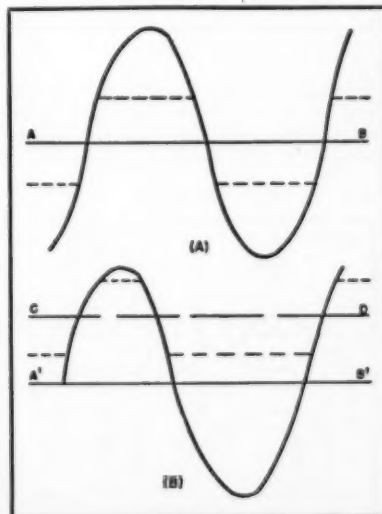


Fig. 3



<sup>1</sup> Garner, Louis E., Jr., "Wide Frequency Range Square-Wave Clipper, Radio & Television News, March, 1950.

<sup>2</sup> Garner, Louis E., Jr., "Additional Notes on Square-Wave Clipper," Radio & Television News, July, 1950.



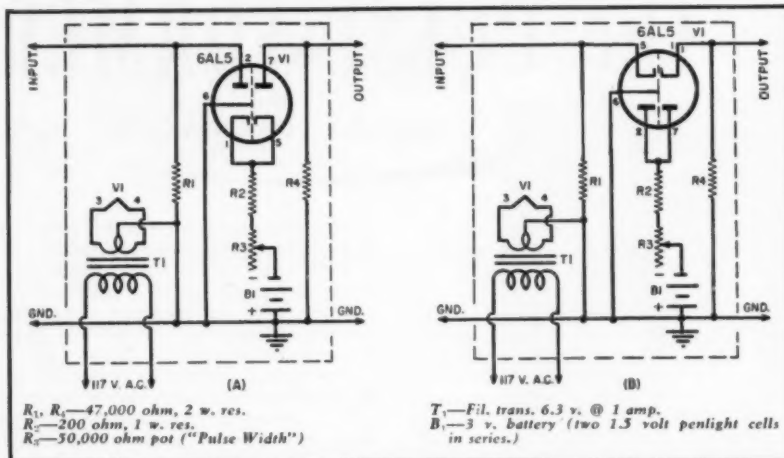


Fig. 4. Diagram of "Pulse-Former." (A) Positive-going pulses, and (B) negative-going pulses.

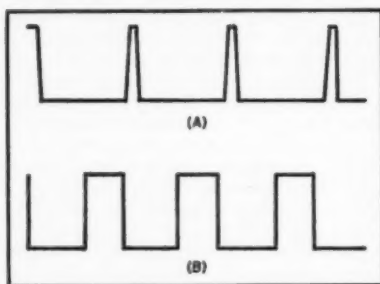


Fig. 5.

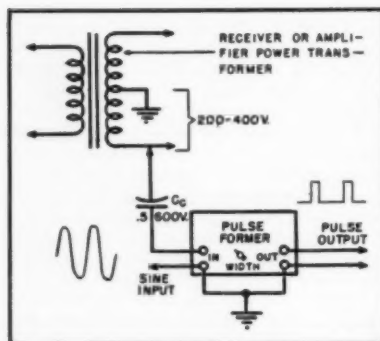


Fig. 6.

loading may be obtained by comparing the sizes of  $R_1$  and  $R_2$ , Fig. 4A (assuming  $R_2$  adjusted so that it is not in the circuit).  $R_1$  has a value of 47,000

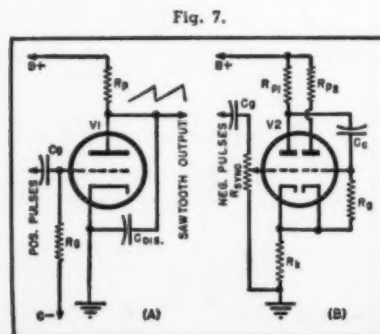


Fig. 7.

ohms, while  $R_2$  has a value of only 200 ohms. Thus, with the first diode conducting, the input impedance is slightly less than 200 ohms ( $R_1$  and  $R_2$  in parallel). On negative half-cycles, the input impedance is again almost 50,000 ohms. With a medium to high impedance signal source, the amplitude of the positive halves of the signal drops considerably when compared to the negative half-cycles. This results in the circuit "clipping" only the extreme peaks of the positive half-cycles, with the output assuming a pulsed form.

By varying the size of  $R_2$  by means of  $R_3$ , in series with it, the degree of unequal loading may be changed, and hence the pulse width varied. Thus  $R_3$  acts as a pulse-width control.

With the values shown in the parts list, the pulse width of a 60 cps signal may be varied from the minimum shown in Fig. 5A to the maximum shown in Fig. 5B. The pulses are actually as sharp and square as shown.

The circuit shown in Fig. 4A delivers positive-going pulses, since it is the positive "half" of the applied signal that is loaded. To obtain negative-going pulses, it is only necessary to reverse the plate, cathode, and battery connections of the clipper, giving the circuit shown in Fig. 4B.

If the device is constructed in a standard 4"x5"x6" metal utility box, like the author's (Fig. 1), it is not necessary to make a sub-chassis. The one tube socket used may be mounted on long machine screws with spacers to prevent the pin lugs from shorting to ground. The small filament transformer is simply bolted to the side of the metal box, while the two small pen-

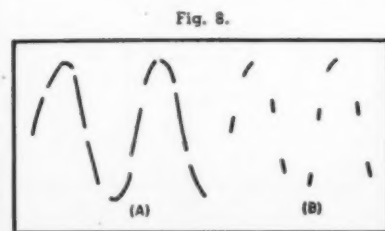


Fig. 8.

light cells (connected in series to provide 3 volts) are clamped or strapped to the back panel.

All wiring is point-to-point, with the input and output resistors ( $R_1$  and  $R_2$ ) mounted directly between the binding posts.

If preferred, the filament transformer may be eliminated, with filament voltage for the 6AL5 being supplied by the power supply of the circuit or device with which the "Pulse-Former" is used.

If a fixed pulse-width is desired,  $R_3$  may be eliminated, and  $R_2$  replaced with a fixed resistor having a value to give the desired pulse width. Determine the proper size resistor to use experimentally by observing the output on a scope and varying  $R_2$  until the desired pulse is obtained.

Once construction is finished, the "Input" terminals of the "Pulse-Former" are connected to an appropriate sine-wave signal source. The higher the voltage available, the better the pulse formation. For 60 cycle pulses, an ordinary power transformer may be used, as shown in Fig. 6. Condenser  $C_0$  serves to block d.c. (assuming the power transformer to be in a power supply circuit) and also to convert the source into a comparatively high impedance source.

If pulses at some other frequency are desired, use an audio oscillator having a medium to high impedance output, with a peak voltage of at least 100. If sufficient voltage is not available, use a conventional audio amplifier, with a step-up transformer on the output. A coupling condenser must still be used to avoid shorting the battery  $B_1$  (Fig. 4A) with the transformer winding. Determine the correct condenser size by experiment.

An oscilloscope can be connected to the "Output" terminals, and the "Pulse-Width" control adjusted until pulses of the proper form are obtained. The pulse output is then connected to any circuit desired.

If there is a possibility of a d.c. short to ground existing in the circuit to which the pulse output is connected (transformer primary, for example), or if there is a d.c. voltage present, use a coupling condenser between the output "hot" terminal and the circuit for blocking purposes. A .5  $\mu$ fd., 600 volt condenser will be satisfactory for most applications, but a larger condenser may be required if the circuit has a comparatively low impedance input.

The experimenter, technician, and engineer will undoubtedly have many uses in mind to which sharp pulses might be put. It would be worthwhile, however, to list a few of the more common applications.

A positive-going pulse may be used in connection with a triode tube and condenser to form almost perfectly linear saw-tooth signals as shown in Fig. 7A. Condenser  $C_{dis}$  charges slowly through  $R_p$  while  $V_1$  is biased to cut-off by  $C_-$ . When the positive pulse arrives, tube  $V_1$  conducts during the period of the pulse, rapidly discharging

$C_{diss}$ , and forming the retrace of the saw-tooth signal. The retrace time may be varied by changing the pulse-width.  $R_p$  and  $C_{diss}$  may be chosen experimentally to give the best saw-tooth at the pulse rate used.

With a circuit like that in Fig. 7A, the saw-tooth frequency depends solely upon the pulse rate, and hence a stable linear sweep may be obtained (depending, of course, upon the stability of the pulse source).

Conventional sweep circuits used in cathode-ray oscilloscopes, multivibrators and relaxation oscillators, blocking oscillators, and similar circuits sync much better with pulse signals than with sine waves or complex signals. Hence, pulses are often used for syncing such circuits.

As an example, the Potter multivibrator shown in Fig. 7B syncs best when negative-going pulses are applied to its grid. Negative pulses may be obtained with the circuit shown in Fig. 4B.

The amplitude of the pulses obtained with the "Pulse-Former" depends upon the size of the battery. If this is increased to higher voltages, then the pulse height increases, but correspondingly higher drive voltages are required for good pulse formation.

Even the approximately three volts peak pulse obtained with the circuit as given in Figs. 4A and 4B is sufficient for "intensity" modulation of some scopes. When used in such an application, the pulses from the "Pulse-Former" may be used for blanking retrace or for comparing frequencies.

When the output is connected to the "Intensity Modulation" terminals of the scope, the beam may either be made brighter or darker on pulses, depending on the internal connections in the scope itself. As an example, if positive-going pulses are used and the "Intensity" connections are to the cathode of the CRT, then the beam will be made darker on pulses and may even be blanked out entirely (depending on the setting of the "Intensity" control on the scope).

If a sine wave is observed on the scope with a frequency much lower than the pulse rate, it will be broken into a series of dashed lines as shown in Fig. 8A.

On the other hand, if the internal connections of the scope are to the grid, the beam will be made brighter on pulses, and a similar signal may appear as a series of dots or very short dashes as in Fig. 8B.

For frequency comparison, it is only necessary to count the number of complete cycles between pulses on the CRT screen. As an example, if there are three complete cycles of an observed signal on the screen of the scope between the short dashes representing the pulses, the frequency of the observed signal is three times that of the pulse rate.

As the experimenter begins to work with pulses, he will discover more and more uses to which they may be put.

-30-

# Mac's RADIO SERVICE SHOP

By JOHN T. FRYE



## SERVICING THE HARD WAY

**G**LANCING up from the variable inductance TV tuner on which he was working, Mac saw his assistant, Barney, rummaging around in the wall cabinet that housed the shop's collection of cleaners, solvents, varnishes, stains, lubricants, etc., and said, "Hey, Red, while you're up there in the bottle goods department, how's about handing me down that bottle of Stanol #15 Lubricant for this tuner?"

"Here you are, Boss," Barney replied, "but I sure would like to know what the heck happened to that bottle of carbon tet I know I saw up here this morning."

"That's easy," Mac observed blandly as he went on squirting carbon tetrachloride from the pressure-type oil can in his hand over the inductances of the tuner so as to wash away completely the old lubricant and the dirt imbedded in it; "it's sitting right here on the bench in front of me."

"Looks like you'd tell a man," Barney growled as he pulled a piece of cleaning tissue from a wall dispenser and saturated it with the cleaning fluid.

"What are you going to do with it?" Mac wanted to know.

"Wipe some grease smudges off this white plastic cabinet. Why?"

"First, try a little spot on the inside of the cabinet that will be covered by the chassis."

Barney obediently moistened a small spot on the bottom of the cabinet, and some of the cleansing tissue stuck to it.

"Well whadda you know!" he said in amazement; "carbon tet cuts that finish! I never noticed that happening before, and I have cleaned dozens of cabinets with the stuff."

"Yes, I know," Mac replied; "and it will not hurt many of the older cabinets; but I learned the hard way that you had better not use carbon tetrachloride on many of the cabinets coming out lately without doing a little testing first. The best idea is just to stick to good old soap and water and elbow grease. It takes a little more time and effort, but it's safe."

"Sure is funny how many times the best way seems to turn out to be the hardest way," Barney grumbled as he went to work with the soap and water. A few minutes later he had finished with the little white radio and had put a storage battery portable on the bench. When he turned it on, a loud hum came from the speaker along with the program. The hum was present even when the a.c. cord was not plugged in.

"Okay, Brains," he said to Mac who had completed cleaning and lubricating the tuner and was now replacing it in the chassis, "what's the matter with this one? Does your educated ear say that it is filter condensers, or is the battery no good? I don't want to take that front cover off unless I have to."

"I'm glad you know that a weak battery will cause a loud hum in one of these jobs—especially when the set is working on a.c.," Mac said approvingly; "but if I remember rightly, you put a new battery in that set not over a couple of months ago. Try wiggling the battery around a little."

Barney slipped off the cover of the power supply compartment and moved the battery around. Immediately the humming stopped.

"Wipe that smug look off your face  
(Continued on page 116)

# LIGHT METER for that DARKROOM

By  
**STEWART BECKER**

***Construction details on a 3-tube electronic light meter. It operates from a 117 volt a.c.-d.c. source and is calibrated in seconds-exposure.***



The meter, positioned as shown, will indicate intensity of the light that would actually fall on the sensitized paper, eliminating exposure errors.

**T**HE light meter to be described was designed and built for use in the amateur photographic darkroom to eliminate test exposures when making enlargements. Just as your exposure meter out of doors collects light from a representative part of the scene you are about to photograph, so this light meter collects light from a representative part of the image on the enlarging easel. Making this measurement right at the sensitized paper rather than at the negative eliminates any calculations involving lens aperture and number of times enlargement. Just focus up the enlarger as you always do, set the light meter on the easel so that a representative part of the picture falls on the window over the phototube, open the window and read the number of seconds exposure directly on the meter. It's that simple and the results will run about the same percentage correct as they do when using an exposure meter out of doors.

The unit is constructed in a flat plywood box with a metal panel. It measures  $2\frac{1}{2}$  inches deep by  $7\frac{1}{4}$  inches by  $8\frac{1}{2}$  inches. It will operate from a 117 volt a.c. or d.c. circuit. The light meter is essentially a bridge circuit with a 100 microampere d.c. meter as an indicator of balance. Light falling on the phototube unbalances the bridge, causing the meter to read.  $R_1$  controls the amount of voltage applied to the anode

of the phototube thus acting as a sensitivity control for papers of various speeds.  $R_2$  is a zero adjustment for balancing the bridge for zero reading when the phototube is dark.

A single vacuum tube Type 117N7-GT consisting of a beam power pentode and a diode, in conjunction with a voltage regulator tube and a phototube, are the only vacuum tubes required. The 117N7 was used because its filament can be connected directly across the 117 volt power line thus eliminating the necessity of a filament transformer. Since the plate resistance of the 117N7 in this circuit is about 9000 ohms, the zero adjustment should balance at about the middle of its range. The two 1000 ohm resistors in series with the 3000 ohm zero adjustment potentiometer are for the purpose of preventing the zero adjustment from being too critical. If you don't mind this adjustment being a bit critical, they can be omitted. If you want the adjustment to be less critical, increase the value of these two resistors.

The diode of the 117N7 is used as a half-wave rectifier to supply d.c. voltage for the operation of the pentode and the phototube. The voltage from this diode is stabilized at 90 volts d.c. by a VR-90 voltage regulator tube. This voltage regulator is absolutely essential unless you have unusually stable line voltage. It prevents line

voltage fluctuations from causing the meter reading to vary up and down with these fluctuations. If you have some rapid kicks in your line voltage which this tube will not handle, try putting a condenser across the 10 megohm grid leak ( $R_3$ ) to increase the time constant of this circuit. A .1  $\mu$ fd. at this point will give this circuit a time constant of one second and this should stabilize the meter against these kicks. If you think the meter is too sluggish with this value of condenser, reduce it to a .05  $\mu$ fd. or a .01  $\mu$ fd. or to a value which gives you the best operation for your line voltage conditions and your temperament.

If you want more sensitivity than the circuit as shown provides, just increase the resistance of the grid leak but don't get it too high or you will find that your light meter works fine on dry days but is off calibration on humid days. Ten megohms should be a good all-around value, or even twenty megohms. Values up to 700 megohms have been used with satisfactory results here in Arizona, but this would not be the case in most locations.

When using this light meter, never open its window when the white light is turned on in the darkroom or the meter may be damaged. Its sensitivity is many times that of a conventional exposure meter and this must be kept in mind when using it. It is best to





# SIGNAL SUBSTITUTION In TV Servicing

*Once set up, test signals from a spare receiver serve as a quick and accurate means of servicing troublesome TV sets.*

By  
**DANIEL LERNER**  
Supervisor of TV Service  
Philco Corporation

**M**ANY times the technician is puzzled by a particularly difficult television receiver trouble. He often suspects an individual stage, for in one way or another he is able to go through a troubleshooting procedure which will isolate the suspected stage. This procedure of trouble isolation can, in many instances, be accomplished quite easily, but in other cases this procedure may prove extremely difficult. Why not a simple system of signal substitution, so that a signal of the correct type can be furnished in place of one which is doubtful? While this article deals primarily with synchronizing and deflection signal substitution, audio and video signals can also be injected by substitution.

A bench setup where the receiver is wired to furnish the test signals is shown in Fig. 1. The various signals are wired from the receiver as shown in Fig. 3, and connected to their respective jacks.

J<sub>1</sub> provides a composite video signal for testing a complete video amplifier.

An average value of 2 volts peak-to-peak for most TV receivers, as measured at the video detector load, should be available at this point. The amplitude of the signal may be checked with a calibrated oscilloscope. Perhaps before any more of the connections and functions are explained, it would be well to discuss oscilloscope calibration, since it is necessary to check the signal levels at the jacks.

## Calibrating an Oscilloscope

The vertical gain control of a service oscilloscope may be calibrated so that the instrument can be used to measure peak-to-peak voltages. A simple way to make this calibration is by determining the vertical gain control settings, for a specific amount of deflection, when measured values of r.m.s. voltages corresponding to the desired peak-to-peak values are applied to the vertical deflection plates of the oscilloscope.

The scale of the vertical gain control should be calibrated for 100 volts, 50 volts, 25 volts, 10 volts, 5 volts, and 2 volts, peak-to-peak. Since an ordinary a.c. voltmeter reads r.m.s. voltage, it is first necessary to determine what voltmeter readings are equivalent to these peak-to-peak voltages. This is accomplished by dividing the peak-to-peak voltages by 2.828. Peak-

to-peak and equivalent r.m.s. values are:

PEAK-TO-PEAK VOLTS	R.M.S. VOLTS
100	35.4
50	17.7
25	8.8
10	3.5
5	1.8
2	.7

To calibrate the oscilloscope, follow this procedure:

1. Connect an a.c. voltmeter, a 20,000 ohm, voltage dividing potentiometer, a transformer, and the oscilloscope as shown in Fig. 2A. The transformer is used for isolation purposes and may be a 1:1 audio inter-stage transformer or equivalent. Do not use horizontal sweep on the oscilloscope.
2. Adjust the potentiometer for a reading of 35.4 volts on the meter (35.4 volts r.m.s. equals 100 volts peak-to-peak).
3. Adjust the vertical-gain control of the oscilloscope to obtain a 1" (one-inch) deflection.
4. Using a wax crayon, make two horizontal lines across the scope tube, as shown in Fig. 2B, placing the lines across the top and the bottom of the 1" vertical indication on the screen. These two lines will be used to indicate full-scale readings of peak-to-peak voltages. Next, mark off the short horizontal lines as shown, dividing the 1" space into 10 divisions. These lines will be used for reading intermediate voltages. Cover the face of the tube with a layer of cellulose tape, to prevent smudging of the lines.
5. The voltage which was applied to the scope in steps 2 and 3 establishes the vertical gain control setting for a full-scale reading of 100 volts, peak-to-peak. Scratch a line at the vertical gain pointer setting, and label this line "100 v."
6. Adjust the potentiometer until the meter reads 17.7 volts, adjust the vertical gain control for the 1" deflection, and mark the point indicated by the pointer of the vertical gain control. Label this point "50 v."
7. Repeat step 6, using meter readings of 8.8, 3.5, 1.8, and .7 volts. In each case, mark the point of the vertical gain control setting, and label these points "25 v.," "10 v.," "5 v.," and "2 v.," respectively.

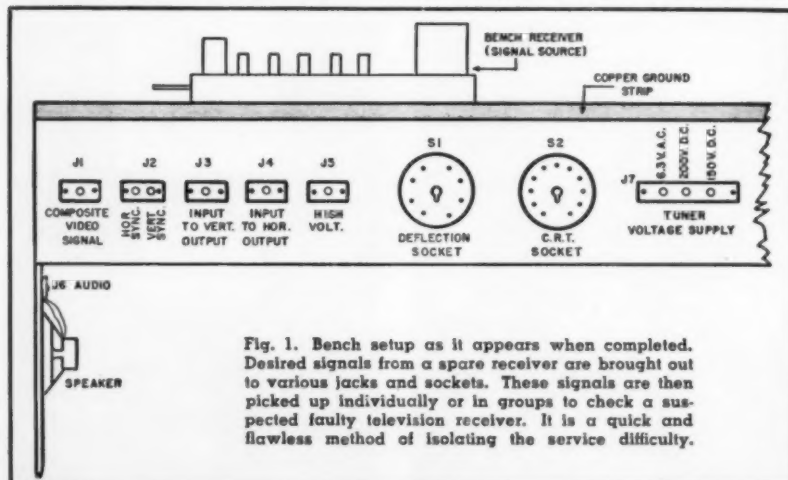


Fig. 1. Bench setup as it appears when completed. Desired signals from a spare receiver are brought out to various jacks and sockets. These signals are then picked up individually or in groups to check a suspected faulty television receiver. It is a quick and flawless method of isolating the service difficulty.

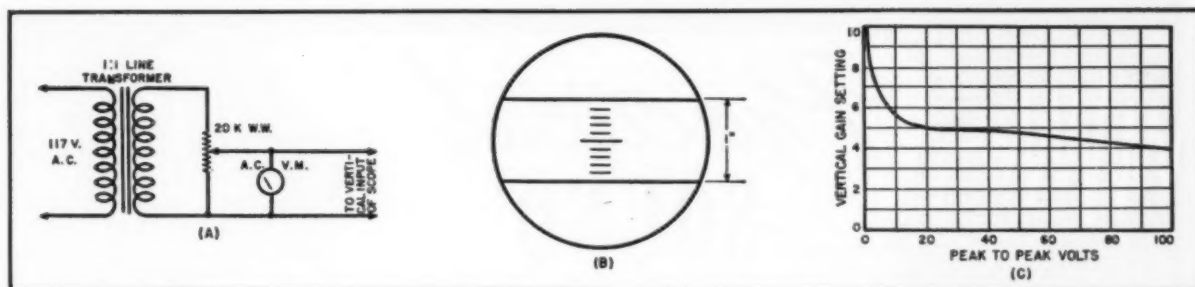


Fig. 2. (A) Wiring diagram of setup used to calibrate oscilloscope vertical gain control. (B) Oscilloscope tube marking for peak-to-peak voltage measurement. (C) Graph showing oscilloscope vertical gain control calibration.

After the outlined steps have been completed peak-to-peak voltages can be read directly from the oscilloscope screen. The voltage is directly proportional to height of the vertical deflection. For example, assume that the gain control is set for 100 volts, and that the voltage being measured gives a deflection covering 8 of the spaces between the full-scale limit lines. The amount of deflection is then 8/10 of the full-scale value. Therefore, the peak-to-peak voltage is 8/10 of 100 volts, or 80 volts.

If desired, a graph may be drawn for the particular scope being calibrated. Fig. 2C illustrates a typical curve, showing peak-to-peak voltages

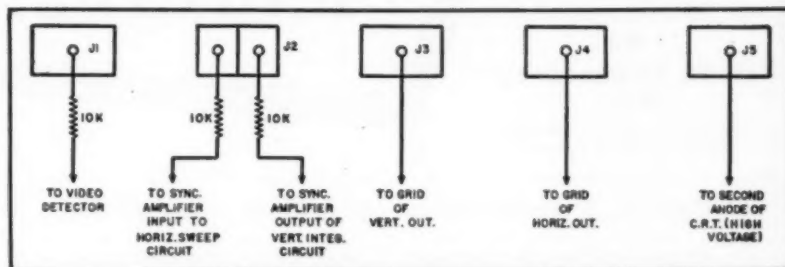


Fig. 3. Method for connecting jacks to sync and deflection circuits of TV receiver.

plotted against vertical gain control settings.  $J_2$  in Fig. 3 is the jack where the vertical and horizontal sync signals from the receiver are connected. The verti-

(Continued on page 114)

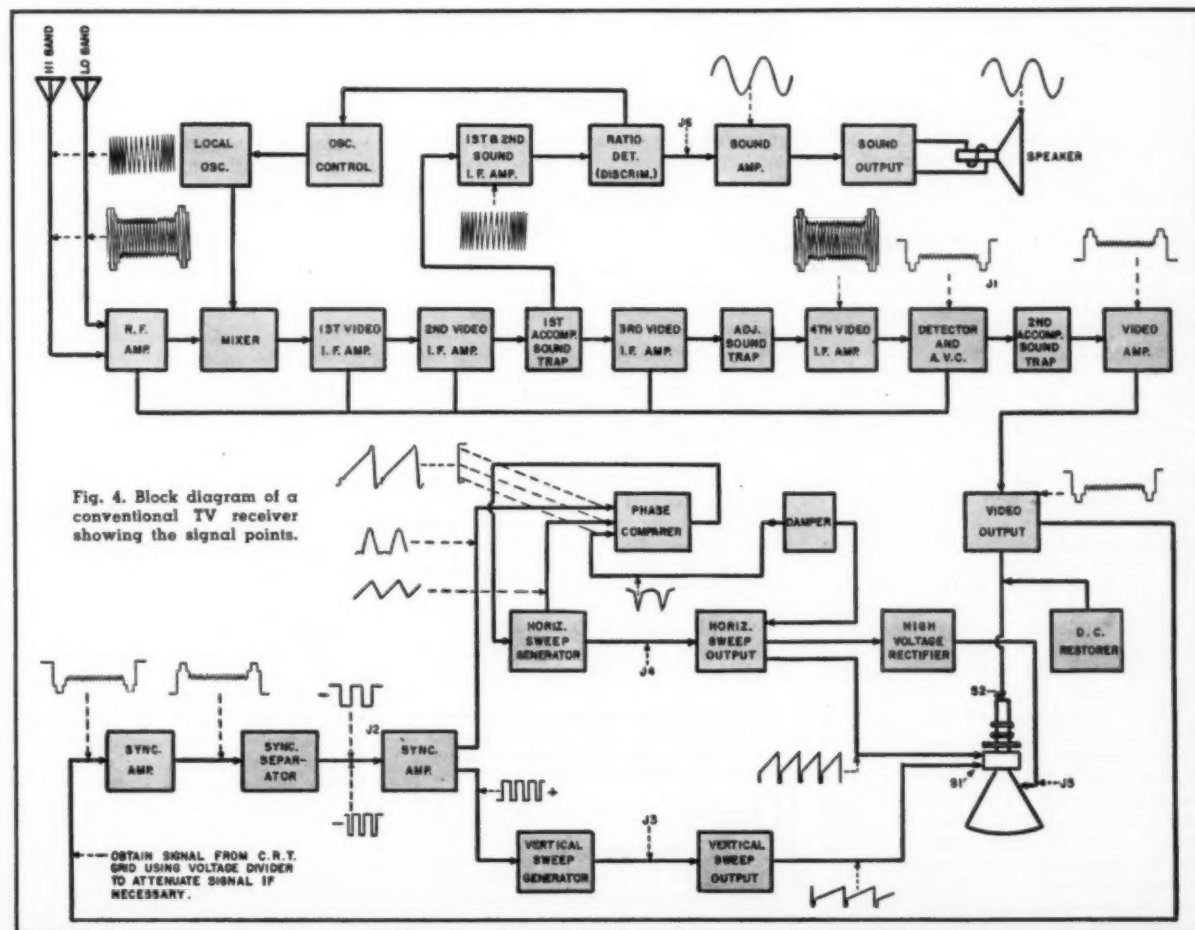


Fig. 4. Block diagram of a conventional TV receiver showing the signal points.



# Practical SOUND ENGINEERING

By  
**H. M. TREMAINE,**  
**D.Sc.**

College of Audio Engineering  
University of Hollywood

## Part 6. A discussion of the type of equalization required by the various kinds of sound systems.

**B**ASICALLY, sound systems used in broadcast, commercial recording, motion pictures, and television are quite similar in nature and, in general, require much the same equipment.

Flexibility in operation is of prime importance because of the great variety of combinations of equipment required, and the many different situations arising during production, also the frequency characteristics of the sources of sound which are employed. In the broadcasting industry the source of sound may be from a remote point transmitted over a telephone line, a live pickup from a studio, or a recorded program from magnetic tape or a record. If we include television much of the recorded material will be from film.

Each of the sources or systems of reproduction will require individual consideration with respect to frequency response if the best reproduction is to be obtained. This means that the equalization for each type reproduction will be different and will vary with different recordings. It is necessary, therefore, that equalization be variable over a wide range.

It is the purpose of this series to discuss the different methods which may be employed in order to obtain good commercial sound recording and reproduction, and not to recommend any particular system or equipment.

Fig. 1 is a basic block diagram of a sound system employing a single amplifier for both recording and reproduction. Most laymen believe that if an amplifier has flat frequency characteristics, it will produce the best sound. This is true within certain limits. Amplifiers with uniform frequency response are desirable, but some means must be provided to compensate for the frequency response of

Manufacturer	Speed	Turnover
Columbia and Mercury	78	300 cps
Columbia and Mercury	33 1/3	500 cps
RCA	78	500 cps
Decca 4trr	78	300 and 400 cps
Technicord	78	650 cps
Miscellaneous	78	250, 700, 100 cps
Vertical Recording	33 1/3	400 cps

Table 1. Turnover frequencies for most of the better-known recording labels.

recorded program material and the recording characteristics of the recording media. Even when the program is picked up from a studio, it will require some equalization to secure the best results.

Professional audio systems generally use amplifiers of wide range, low distortion and noise, and uniform frequency characteristics, then insert devices for frequency correction external to the amplifiers. These devices are of low impedance and may be "patched" into the system at various points to secure the desired correction.

Referring again to Fig. 1, at the left is an electric pickup unit for record reproduction and a microphone for live pickups. At the right is a cutting head for recording disc records and a loudspeaker for playbacks and monitoring. Switches are provided at both the input and output for selecting the various combinations of the equipment.

Using the system as shown, with an amplifier of flat frequency character-

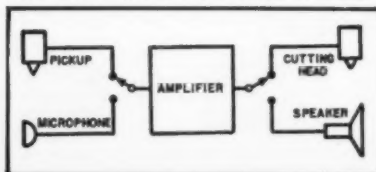
istics, would result in fair reproduction. However, a problem immediately presents itself in the case of record reproduction. No standard recording characteristic has been set up by the various recording companies. Each recording activity has its own idea of what constitutes the best recording characteristic. This may be confirmed by checking the turnover frequency in the recording characteristics of the several leading record manufacturers. A summary of these characteristics is given in Table 1.

This problem, coupled with the response of the reproducer unit, poses a problem for the audio engineer, as he may be called upon to switch from one frequency characteristic to another several times in a program while keeping the over-all sound quality uniform. It may be seen that if the amplifiers of the system were corrected within themselves for one type of reproduction, they would not be suitable for other types of reproduction or recording.

For disc record reproduction, the equalization takes into consideration the frequency of the turnover and the constant-amplitude / constant-velocity characteristics of the recording head. Magnetic tape recording and reproduction must be compensated to include the response of the tape and any variations in the recording and reproducing heads. Generally, the characteristics of the magnetic tape itself will be quite uniform and if the recorder is properly equalized it will be suitable for most tapes.

Magnetic tape requires a special form of equalization known as "pre and post" equalization. This compensation is divided between the recording and reproducing sections and is fixed in the recorder. The frequency response will vary somewhat from machine to machine and also with different manufacturers. Generally, tape is played back from the reproducer unit through a "flat" channel. With proper equalization the greatest variation in reproduction will probably come from studio characteristics and from microphone placement in the original recording.

Fig. 1. Basic block diagram of a sound system which uses a single amplifier for both the recording and reproduction of sound.



So far we have confined most of our discussion of frequency compensation to reproduction; however there are similar problems involved in recording. For 16-inch transcriptions running at a speed of  $33\frac{1}{3}$  rpm we may use the recording frequency response recommended by NARTB, or base it on the reproducing curve recommended by the Audio Engineering Society (Fig. 2). For microgroove discs running at  $33\frac{1}{3}$  rpm, the characteristic is similar to that used for standard 16-inch  $33\frac{1}{3}$  rpm, except for the low end which is down 13 db at 50 cps rather than 16 db. For 45 and 78 rpm discs the characteristic may be a so-called flat one with a small rise starting around 4000 cps. and continuing out to 10,000 cps.

For film recording and reproduction the equalization must include compensation for the losses of the reproducer optical system and laboratory processing. The equalization will vary with the type system and whether it is 16 mm or 35 mm film. If the recording channel is used for straight film recording, the compensation required for the processing losses may be incorporated in the microphone preamplifier.

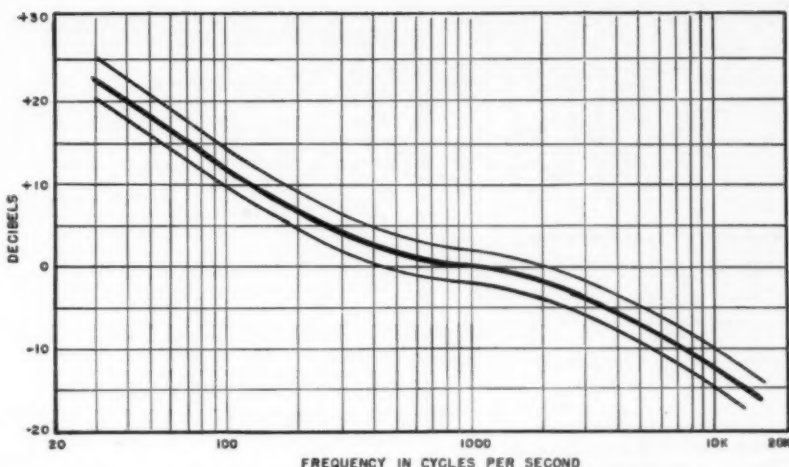


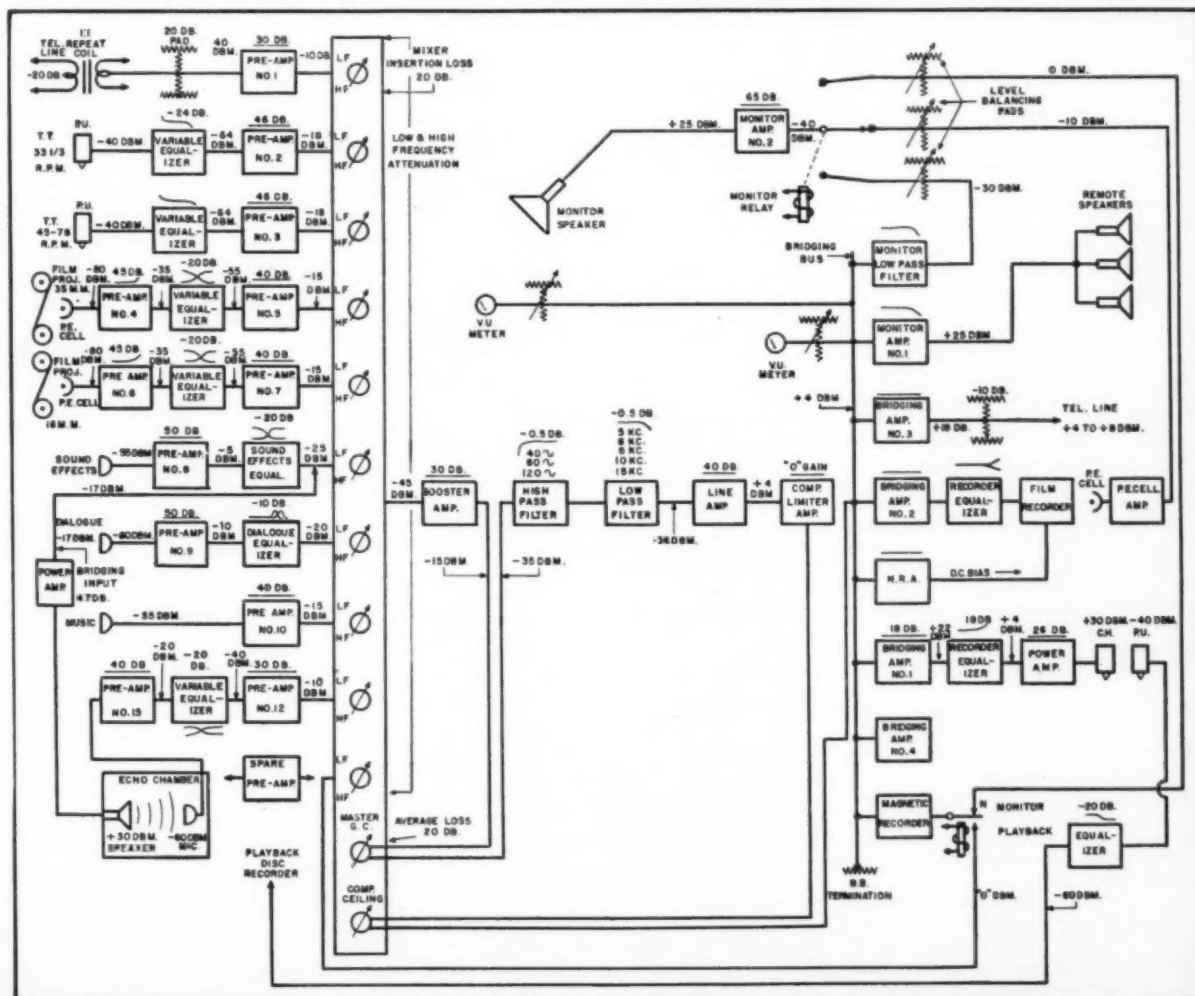
Fig. 2. The AES (Audio Engineering Society) standard reproducing curve.

For film recording in television where the preamplifiers are used with other equipment this is not practical. In this case, the equalization is inserted in the system at the film recorder

where it cannot be removed by accident. Also, it may be changed for either 16 mm or 35 mm recording.

Fig. 3 is a block diagram of a composite sound channel for both record-

Fig. 3. Block diagram of a composite sound channel for recording and reproducing. Disc, magnetic tape, and film recorders are included.



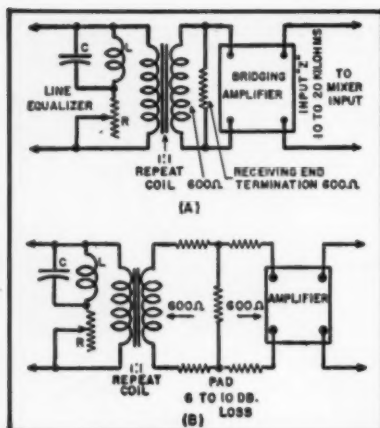


Fig. 4. Method of connecting audio equipment to a telephone transmission line.

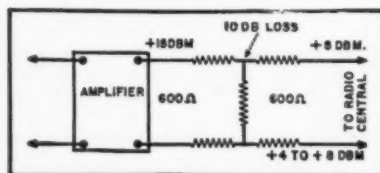


Fig. 5. When program material is transmitted to a remote point, the output of the equipment feeding the line must be isolated by means of pad of at least 10 decibel loss.

ing and reproduction. Included are disc, magnetic tape, and film recorders with their equalizers for obtaining individual frequency characteristics for each type of recording. Three types of monitoring have been provided to allow listening checks of the program material at the bridging bus or at the recorders. As stated before, this block diagram is not intended to represent any particular installation, but is a composite system to illustrate the requirements imposed and the various pieces of equipment that may be necessary to achieve a certain result. Above each unit is its frequency characteristic, gain or loss, and the approximate input and output levels. In actual practice, equipment will be patched in and out as required. In the production of television shows, it is not uncommon to use all systems of reproduction and recording shown in the diagram at some time during the production. No attempt has been made to include stage playbacks for process shots. As we progress with the diagram, the details of each piece of equipment will be discussed.

It will be assumed throughout this discussion that all impedances are matched and that the input circuits of the amplifiers following an equalizer or filter presents a "solid" termination. The microphone and photocell amplifiers may be operated open circuit (unterminated secondary), if desired, to obtain more gain.

The first source of sound to be encountered is at the upper left of the diagram, from a remote point, and is being received over a telephone line. As a rule, telephone lines are equalized

for a definite frequency response, which will be determined by the service it is to render.

For FM transmissions the line is equalized within plus or minus 1 db from 30 to 15,000 cycles; AM broadcast 50 to 10,000; and for other services not requiring such a wide frequency range 80 to 5000 cycles.

The equalizer is adjusted by the telephone company and placed at the receiving end of the line or terminal point. A 600-ohm repeat coil is included with the equalizer to isolate the line from the terminal equipment, Fig. 4A. The output side of the repeat coil is terminated by the user and connected to the input of a bridging amplifier which may be a preamplifier modified for this purpose. The output of this amplifier is fed directly into the mixer input.

If it is desired, the output of the line repeat coil may be fed into an amplifier with a matched input of 600 ohms. However, when this type connection is made it is desirable to connect a pad of at least 6 db loss between the output of the line and the input of the amplifier, Fig. 4B. The purpose of the pad is to provide a "solid" termination for the line and "isolate" it from the terminal equipment. Pads used for this purpose are often referred to as "n" db of isolation. It is important that the configuration of the pad conform to the input circuit of the terminal equipment.

When program material is to be transmitted to a remote point, the telephone company requires that the transmitted level at the sending end be within the limits of plus 4 to plus 8 dbm. Also, that the output of the equipment feeding the line be isolated by a pad of at least 10 db loss, Fig. 5. This circuit is also shown at the right of the block diagram at the lower end of the bridging bus. The amplifier feeding line must, of course, have sufficient power output to overcome the loss of the pad and still produce a level of plus 8 dbm at the output of the pad. This will require an amplifier with a minimum power output of plus 18 dbm.

The next source of sound shown is a transcription turntable running at a speed of 33 1/3 rpm. Transcription turntables designed for broadcast generally have a pickup equalizer installed as an integral part of the equipment and a preamplifier to compensate for the loss of the equalizer which generally runs about 24 db. The average output level of a pickup is approximately minus 40 dbm. Adding the loss of the equalizer to the output level of the pickup results in an output level of a minus 64 dbm at 1000 cycles. For turntables without equalization, a variable equalizer that will provide standard response curves as well as other characteristics will be required. Several excellent articles on this subject have appeared in previous issues of this magazine.

The output of the equalizer is fed into a preamplifier of 46 db gain which results in an output level of minus 18 dbm, a convenient input level for the mixer. A second turntable for 45 and

78 rpm record reproduction is also shown; the same conditions prevail here as for the 33 1/3 rpm unit.

Below the turntables are shown two film projectors for television use. Both machines are shown with their output circuits fed from a photocell preamplifier directly into the mixer console.

As a rule, the preamplifier is placed either near or in the projector housing to increase the signal-to-noise ratio; however, some machines take the output signal from the photocell through a transformer and the preamplifier is installed at a distant point. The first method is to be preferred.

Sixteen millimeter motion picture prints generally present the greatest problems in television transmission as they employ a different frequency response from 35 mm film; also, many companies producing 16 mm films do not adhere to any particular frequency characteristic. The many different methods used to produce 16 mm films, coupled with the fact that some are optically printed from 35 mm originals, complicates the situation.

In either case equalizers will be required to compensate for the difference in recording characteristics of the film projected. When films of recent production made for regular theater use are projected, the frequency characteristics and levels are fairly uniform and will require little correction. However, the majority of motion pictures transmitted by television stations today were made several years ago when the frequency characteristics and levels were not as closely controlled. Also, at that time, the industry was undergoing changes in methods of recording and processing. It was not uncommon to find pictures being transmitted by television that were recorded many years ago using a "glow" tube, the original recording system developed by De Forest.

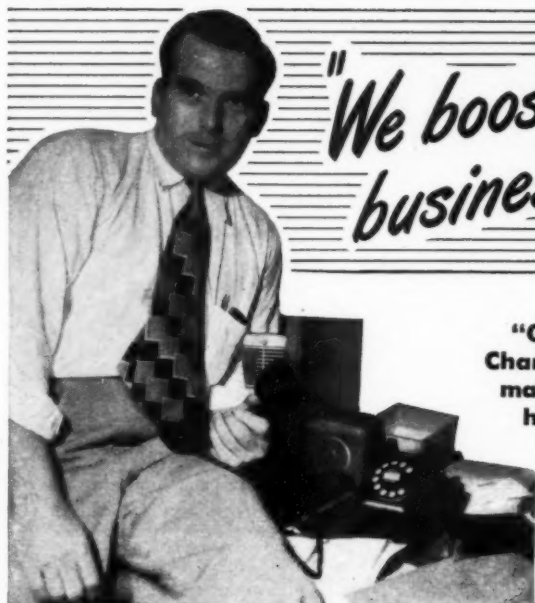
Foreign productions of early vintage are very spotty in level and frequency response and require constant frequency and level correction throughout their length.

If the production is old, it may have a high background noise, yet the print may be in good shape. A reduction in the high frequency response will reduce the background noises with a consequent sacrifice of the high frequencies. This must be done with care, however, or the intelligibility of the dialogue will suffer. Again, the sound may lack high frequency response which is generally the case with early-day productions. If the background noise is not too great, the high frequency response may be increased. If so, the low frequencies must be increased to balance the increase in high frequencies. This is necessary to maintain the correct aural balance.

It should be remembered that motion pictures made for theater reproduction will not always sound right even on a television receiver with a good audio channel. This is because the recording characteristics for motion pictures were determined by making a survey

(Continued on page 84)





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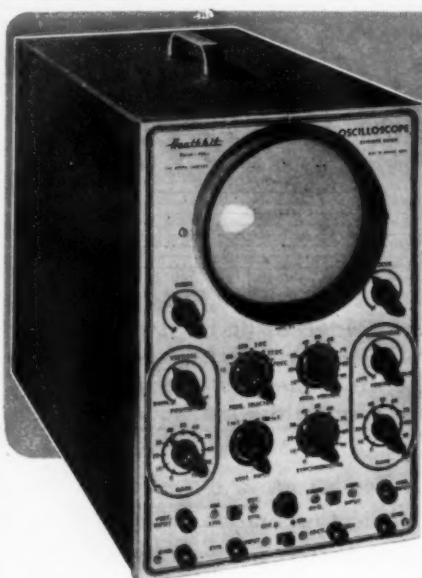
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The horizontal amplifiers are direct coupled to the CR tube and may be used as either AC or DC amplifiers. Separate binding posts are provided for AC or DC. The multivibrator type sweep generator has new frequency compensation for the wide range it covers: 15 cycles to over 100,000 cycles.

The new model 0-6 scope uses 10 tubes in all, including 5" CR tube. Has improved amplifiers for better response useful to 2 megacycles. Tremendous sensitivity .04V RMS per inch horizontal — .09V RMS per inch vertical. Only Heathkit Scopes have all the features.

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The new filter condenser has separate sections for the vertical and horizontal screen grids and prevents interaction between them. An improved intensity circuit provides almost double previous brilliance and better intensity modulation.

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The kit is complete, all tubes, cabinet, transformer, controls, grid screen, tube shield etc. The instruction manual has complete step-by-step assembly and pictorials of every section. Compare it with all others and you will buy a Heathkit.

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The kit is complete; all tubes, switches, cabinet, power transformer and all other parts, plus a clear detailed construction manual.



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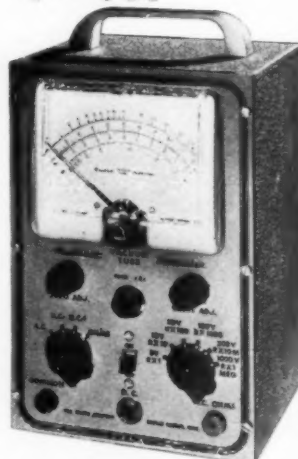
There are six complete ranges for each function. Four functions give total of 24 ranges. The 3 volt range allows  $33\frac{1}{3}\%$  of the scale for reading 1 volt, as against only 20% of the scale on the 5 volt types.

New  $\frac{1}{2}\%$  ceramic precision resistors are the most accurate commercial type available — you find the same make and quality in the finest laboratory equipment selling for thousands of dollars. The entire voltage divider decade uses these  $\frac{1}{2}\%$  resistors.

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Voltage ranges are full scale — 3 Volts, 10 Volts, 30 Volts, 100 Volts, 300 Volts, 1000 Volts. Complete decade coverage without gaps.

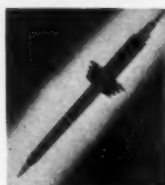
The DC probe is isolated for dynamic measurements. Negligible circuit loading. Gets the accurate reading without disturbing the operation of the equipment under test. Kit comes complete: cabinet, transformer, Simpson meter, test leads, complete assembly and instruction manual.



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# Heathkit TV ALIGNMENT GENERATOR KIT

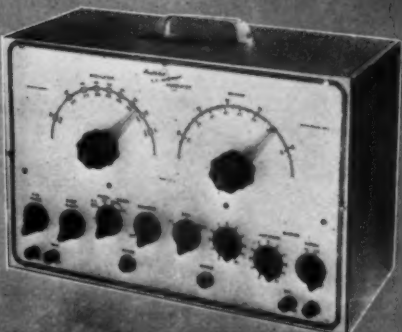
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The instrument provides a frequency modulated signal covering, in two bands, the range of 10 to 90 Mc. and 150 to 230 Mc. — thus, ALL ALLOCATED TV CHANNELS AS WELL AS IF FREQUENCIES ARE COVERED.

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Sweep width is controlled from the front panel and covers a sweep deviation of 0-12 Mc. — all the sweep you could possibly need or want.

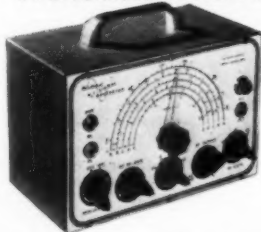
And still other excellent features are: Horizontal sweep voltage available at the front panel (and controlled with a phasing control) — both step and continuously variable attenuation for setting the output signal to the desired level — a convenient instrument stand-by position — vernier drive of both oscillator and marker tuning condensers — and blanking for establishing a single trace with base reference level. Make your work easier. Save time. Repair with confidence — order your Heathkit TV Alignment Generator now!



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This Tube Checker has all the features — beautiful 3 color BAD-?-GOOD meter — complete selection of voltages — roller chart listing hundreds of tubes including the new 9 pin miniatures — finest quality Centralab lever switches — high grade birch, counter-type cabinet — continuously variable line adjust control — every feature you need to sell tubes properly. The most modern type tube checker with complete protection against obsolescence. Uses only the best of parts — rugged oversize 110V 60 cycle power transformer, finest of Mallory and Centralab switches and controls, complete set of sockets for all type tubes with blank spare for future types. Fast action, gear driven roller chart quickly locates the setting for any type tube. Simplified switching cuts necessary testing time to a minimum and saves valuable service time. Simple method allows instant setup of new tube types without waiting for factory data. No matter what the arrangement of tube elements is, the Heathkit flexible switching method easily handles it. Order your Heathkit Tube Checker Kit today and see for yourself that Heath again saves you two-thirds and yet retains all the quality. Complete with instructions, all parts, and cabinet.



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Checks all types of condensers — paper, mica, ceramic, electrolytic. All condenser scales are direct reading and require no charts or multipliers. Covers range of .00001 MFD to 1000 MFD. A Condenser Checker that anyone can read. A leakage test and polarizing voltage for 20 to 500 V provided. Measures power factor of electrolytics between 0% and 50% and reads resistance from 100 ohms to 5 megohms. The magic eye indicator makes testing easy.

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Kit utilizes only highest quality parts, General Radio main calibrated control, General Radio hummer, Mallory ceramic switches, excellent 200 microamp zero center galvanometer, laboratory type binding posts with standard 3/4 inch centers, 1/2% precision ceramic-body type multiplier resistors, beautiful birch cabinet and ready calibrated panel. (Headphones not included.)

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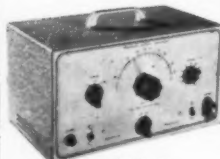
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## NEW *Heathkit* SINE and SQUARE WAVE AUDIO GENERATOR KIT



Model AG-7  
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We proudly present the NEW MODEL Sine and Square Wave Audio Generator Kit. Designed with versatility, usefulness, and dependability in mind, the AG-7 gives you the two most needed waveshapes right at your fingertips—the sine wave and the square wave.

The range switch and plainly calibrated frequency scale give rapid and easy frequency selection, and the output control permits setting the output to any desired level.

A high-low impedance switch sets the instrument for either high or low impedance output—on high to connect to high impedance load, and on low to work into a low impedance transformer with negligible DC resistance.

Coverage is from 20 to 20,000 cycles, and distortion is at a minimum—you can readily trust the output waveshape.

6 tubes, quality 4 gang tuning condenser, power transformer, metal cased filter condenser, 1/2% precision resistors in the frequency determining circuit, and all other parts come with the kit—plus, a complete construction manual. A tremendous kit, and the price is truly low.



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☐ Best Way

Quantity	Item	Price	Quantity	Item	Price
	Heathkit Oscilloscope Kit — Model O-6			Heathkit R.F. Probe Kit — No. 309	
	Heathkit VTVM Kit — Model V-4A			Heathkit H.V. Probe Kit — No. 336	
	Heathkit FM Tuner Kit — FM-2			Heathkit R.F. Signal Gen. Kit — Model SG-6	
	Heathkit Broadcast Receiver Kit — Model BR-1			Heathkit Condenser Checker Kit — Model C-2	
	Heathkit Three Band Receiver Kit — Model AR-1			Heathkit Handitester Kit — Model M-1	
	Heathkit Amplifier Kit — Model A-4			Heathkit Power Supply Kit — Model PS-1	
	Heathkit Amplifier Kit — Model A-6 (or A-6A)			Heathkit Resistance Decade Kit — Model RD-1	
	Heathkit Tube Checker Kit — Model TC-1			Heathkit Impedance Bridge Kit — Model IB-18	
	Heathkit Audio Generator Kit — Model AG-7				
	Heathkit Battery Eliminator Kit — Model BE-2				
	Heathkit Electronic Switch Kit — Model S-2				
	Heathkit T.V. Alignment Gen. Kit — TS-2				
	Heathkit Signal Tracer Kit — Model T-2				

On Parcel Post Orders, include postage for weight shown and insurance. (We insure all shipments.)

On Express Orders, do not include transportation charges—they will be collected by the Express Agency at time of delivery.

Enclosed find ☐ Check ☐ Money Order for \_\_\_\_\_

Please ship C.O.D. ☐ Postage enclosed for \_\_\_\_\_ lbs.

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**The HEATH COMPANY**  
... BENTON HARBOR 15, MICHIGAN

# MARS

## Station of the Month

### MARS BEAMS WEEKLY BROADCASTS

MARS—Army Headquarters station, WAR, located at the Pentagon Building, Washington, D. C., broadcasts a weekly message each Tuesday at 0100Z and at 0400Z. (This is Monday at 8 p.m. and 11 p.m., Eastern Standard Time; Monday at 7 p.m. and 10 p.m., Central Standard Time; Monday at 6 p.m. and 9 p.m., Mountain Standard Time; and Monday at 5 p.m. and 8 p.m., Pacific Standard Time.)

Simultaneous broadcasts are made on frequencies 3497.5 kc., 4997.5 kc., 14,405 kc., and 20,994 kc. Each message is sent three times, once at 10 words per minute, once at 15 words per minute, and once at a higher rate of speed—usually 20 words per minute.

Designed especially to transmit quasi-official traffic and training information to MARS members, the broadcast offers an excellent opportunity for all amateurs to build up their code proficiency.

YOU couldn't tell it from the call letters but AF2SDX is an early bird. He holds the first MARS certificate granted for civilian affiliation with the MARS-Air Force. As a reward for his enthusiasm and early application 2SDX has been named Station of the Month by Captain Charles C. Mack, Chief of MARS-Air Force.

AF2SDX is located at Griffis Air Force Base, Rome, New York. The handle is "Ernie," short for Ernest Storrs, a native of Michigan, expert on Ground Control Approach (GCA) equipment, and engineer with Research and Development at Griffis AFB. Ernie had been waiting for the civilian amateur authorization since MARS first was activated in 1948.

Ernie works all bands but confesses that he prefers 20 meter phone. The big rig at AF2SDX features a pair of

813's modulated by a pair of 811's and runs about 450 watts input. The all-band exciter unit is a modified surplus 696 with a self contained power supply. A Patterson PRC-16 receiver completes the station layout.

AF2SDX reports that there are a number of amateurs at Griffis, about 40 of whom are civilians and potential "MARTIANS." The group has formed a Base Club. They have recently acquired and renovated a building at the Base, and are now equipping it for deluxe operation. Operating positions are being engineered to put four transmitters on the air simultaneously. A classroom is being built for instruction in code and theory. A library, study room, and lounge round out the plush installation.

The key figure in this planning is, of course, Ernie.

Ernest Storrs of Griffis Air Force Base, Rome, New York, gets a handshake from Major General F. L. Ankenbrandt, Director of Communications, USAF, as he receives the first MARS certificate awarded a civilian member of the Air Force MARS.



August, 1951

## NEW! VOL. 2

OF THE BOOK THAT SAVES  
YOUR TV SERVICING TIME!

HOWARD W. SAMS'

### "TELEVISION TUBE LOCATION GUIDE"



Gives Tube  
position and  
function in  
hundreds of  
important TV  
receivers...  
saves you  
hours of TV  
servicing time

FIND THE TROUBLE—REPLACE TUBES  
WITHOUT REMOVING THE CHASSIS

You've asked for more—and here it is—the second volume that brings you right up-to-date. There's nothing like it! The *only* book that shows the *position* and function of tubes in hundreds of TV receivers. Helps you save TV servicing time. Often an operational check in the customer's home—looking at the picture and listening to the sound—gives you a clue to the trouble. Many times only a tube failure is the cause. This invaluable Guide makes trouble diagnosis and tube replacement quick and easy, in most cases *without removing the chassis!* Each TV model has its own clear, accurate diagram. Book is fully indexed for quick reference. All new diagrams—takes up where Vol. 1 leaves off—no duplication. 224 pages, handy pocket size 5½x8½". Pays for itself on the first job!

ORDER TGL-2. *Only* ..... \$200



### VOL. 1. "TELEVISION TUBE LOCATION GUIDE"

This is the initial volume owned and used daily by thousands of TV Service Technicians. Includes tube location and function diagrams of hundreds of important TV receivers made by 56 manufacturers. Saves hours of servicing time—permits diagnosis of trouble and tube replacement without removing chassis.

Over 200 pages; handy pocket size. Order copies for outside calls and for your bench. Own *both* volumes for complete TV tube location data!

ORDER TGL-1. *Only* ..... \$150

### HOWARD W. SAMS & CO., INC.

Order from your Parts Jobber today, or write direct to HOWARD W. SAMS & CO., INC., 2201 East 46th Street, Indianapolis 5, Ind. My (check) (money order) for \$..... enclosed. Send the following books:

☐ TGL-2 "TV Tube Location Guide" \$2.00  
☐ TGL-1 "TV Tube Location Guide" \$1.50

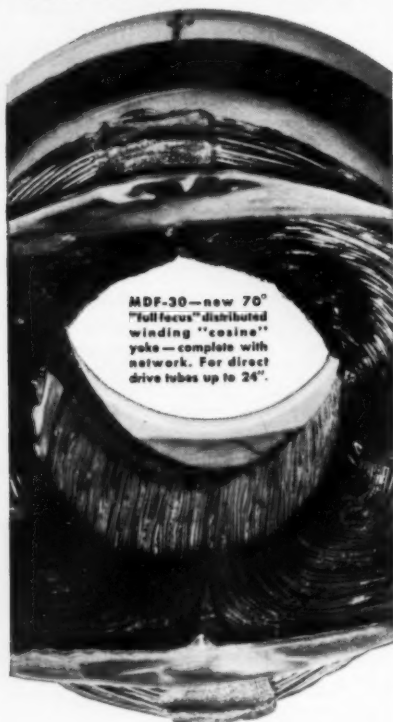
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# MERIT

Best for Better TV Service



MDF-30—new 70" "full focus" distributed winding "cosine" yoke—complete with network. For direct drive tubes up to 24".

## MeritTV full-line\* Components For Conversion or Replacement

### Merit... HQ for TV Service Aids

Keep ahead of TV conversion and component replacement service problems—write **MERIT, HQ for TV Service Aids**.

Ask for your free copy of: Merit TV Repl. Guide; Merit 1951 Complete Catalog N.5111; Merit Auto Vibrator Transformer Dealer Sheet and Repl. Guide, form N.3; Merit Output Transformer Chart, No. 4. Write to Merit Transformer Corporation, 4425 North Clark Street, Chicago 40, Illinois

### These 3 Merit extras help you:

1. Exclusive: Tapemarked © with all specifications and complete hook-up data.
2. Full technical data packed with every item.
3. Listed in Howard Sam's Photofacts.

HVO-8—air core "flyback" for direct drive systems.



\*Merit is meeting the TV replacement component and conversion demand with a line as complete as our advance information warrants!

## WESTERN UNION'S NEW EAST ORANGE TV SERVICE CENTER

THE recent announcement that Western Union intended to enter the TV servicing field has caused quite a stir in the television industry.

Because of the varying opinions as to the wisdom of such a move, RADIO & TELEVISION NEWS' Eastern Editor, Harold Becker, recently made a trip to Western Union's East Orange, N. J. service center to gather up-to-the-minute details on this operation.

Although located in East Orange, this first service outlet is covering the New Jersey counties of Hudson, Bergen, Essex, Union, and Passaic.

This present operation is considered to be a "pilot" operation by means of which Western Union can determine whether or not such a venture can be operated profitably.

The location of this first service center was chosen only after a careful study was made to determine how many television receivers were in the hands of the public in this area and the servicing potential. This study showed that there were approximately 30,000 Du Mont receivers installed in these five counties.

The present operation comprises a crew of seven television technicians and a fleet of seven service cars and two service trucks. All parts and other equipment are purchased through local electronic parts distributors. With this setup, the company reports an average business of \$250.00 a day.

In many instances, Western Union's

price schedule, as shown in the table below, is slightly higher than for other service outlets in the area. Most of the sets are serviced on a per-call basis for which the charge is \$6.00 plus the cost of parts.

Most of the service business has been confined to the Du Mont line. The principal means of promoting business has been through local advertising since they have been unable to obtain a list of Du Mont set owners from the local Du Mont distributor. Since these names are not available to other dealers, the local distributor deemed it inadvisable to make the list available to the Western Union organization.

The over-all picture seems to indicate that the infant service organization is developing at an orderly pace and it is quite likely that they can make a success of the local enterprise. However, unless other manufacturers follow Du Mont's lead, it seems very unlikely that they will be able to promote a similar volume of business in other communities. Although negotiations are going forward daily, Western Union has not lined up any other company at the present time.

Because of the high percentage of Du Mont sets in the East Orange area, this particular section of the country was an especially favorable spot for Western Union to launch its first service venture.

—30—

Television Only Pix Tube	Standard Installation and First Year's Service	Standard Installation and First three months' Service	*Built in Antenna First Year's Service	*Built in Antenna First three months' Service
15", 16", 17"	75.00	55.00	55.00	25.00
19", 20"	85.00	60.00	60.00	30.00
30"	100.00	65.00	75.00	45.00
Extra for Radio, Phono, Tape recorder, pre-selector clock	7.50 each	5.00 each	7.50 each	5.00 each

\*Built in antenna prices apply when existing antenna is used.  
Indoor V antenna \$5.00 extra.

Western Union Services, Inc.'s price schedule for TV installation and service.

Western Union's East Orange service center and one of the company's service fleet.



RADIO & TELEVISION NEWS



# OUTSTANDING VALUES NOW AVAILABLE

## PRE-AMPLIFIER for RELUCTANCE CARTRIDGE



Made by Magnavox. Complete with tubes 6SG7, 6SQ7, 6J7. All wired, ready for use. A remarkable value!

ONLY.....\$2.95

## HARD-TO-GET TUBES

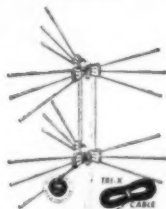
Fully Guaranteed

Quantities Limited—Subject to Prior Sale.

1B3GT...	\$1.06	6K6GT...	\$.59
5Y3GT...	.49	6BC5....	.79
6AK5....	1.47	6CB6....	.79
6AL5....	.79	6BH6....	.89
6AQ5...	.79	6BJ6....	.79
6AU6....	.79	12AT7...	1.29
6AV6....	.65	12AU6...	.79

2X2A....\$ .55

## SNYDER DIRECTRONIC MOTORLESS TV AERIAL SYSTEM



Receive fine signal from all directions. No longer necessary to use Yagi antennas for each band. No longer necessary to use antenna rotors. SWITCH AT SET CONTROLS ELEMENTS IN EFFECT. Simple to install, easy to use.

- All channels for ultra-fringe areas.
- Hi-tensile  $\frac{3}{8}$ " aluminum alloy elements.
- 1 set connecting stubs.
- Universal U clamp for masts up to  $1\frac{1}{2}$ ".

- Directronic Beam Selector.
- 75 feet of TRI-X cable.

COMPLETE...\$16.95

## PHONO CARTRIDGES—Brand New

—Will replace 95% of all cartridges.

1 volt—Standard Mounting.\$1.75 ea.

$3\frac{1}{2}$  volt—Standard Mounting.\$1.85 ea.

## MOST AMAZING SPEAKER MADE! THE "JUNIOR TWELVE"

Size:  $5\frac{1}{4}$ ". Standard Mounting. 2.15 oz. Alnico V Magnet.  $\frac{3}{4}$ " Voice coil impedance 3.2 ohms. Get 12" speaker performance in smaller radio sets, phonographs, TV sets, and sound systems! —at 5" speaker prices! Fundamental resonance of the "Junior Twelve" centers around 85 cycles. Response of the "Junior Twelve" is that of the conventional 12" PM.

NOW ONLY....\$2.79 ea.

## REDUCE YOUR TV RECEPTION TROUBLE



## THE TURRET BOOSTER

- Fully concealed within set.
- Comes on when receiver is turned on.
- No wiring necessary—simple as removing a tube.
- Improves reception—increases video output at least 15%.

Just the thing for fringe area boost or in local areas where antennas are not allowed. PRICE.....\$9.95 (Special discount to dealers)

## BUFFER CONDENSERS

.005 —2000 V...	25c each
.006 —1600 V...	10 for \$2.25
.0075—2000 V...	100 for \$19.50
.01 —2000 V...	

OZ4 Tubes. Fully Guaranteed.  
69c each. 10 for \$6.50

## SPEAKER BUYS OF THE YEAR

4" PM Alnico V Magnet	\$1.49 each
5" PM Alnico V Magnet	10 assorted for \$14.25

## THE PERFECT SPEAKER FOR REPLACEMENT OR SOUND WORK

10" PM 3.15 oz. Alnico V Magnet.  
Rated at 15 watts.....\$3.95 each.  
6 for \$3.75 each.

## TUBE CARTONS

Made of heavy red stock. For miniature tubes.

\$1.25 for 100.
\$11.00 for 1000.
GT OR METAL TUBES
100 for \$1.50
1000 for \$12.50

## CUSTOM BUILT AUTO RADIO

Easily installed. Fine, top quality. Ready to place in your car. Designed for each specific car.

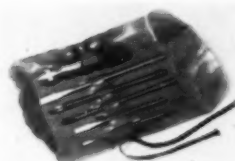
All sets—6 tube. 3 gang; super heterodyne. Extra sensitive circuit. Low battery drain. Beautiful finish and dial. These models now available:

1951—Ford	1948-49-50-51—Hudson
1949-50—Ford	1951—Henry J
1951—Chevrolet	1951—Dodge, Plymouth
1949-50—Chevrolet	1949-50—Dodge, Plymouth
1950-51—Studebaker	

List Price, \$59.95

YOUR PRICE.....\$41.95

## HERE'S A REAL TOOL BUY



This handy, useful 6-piece set with unbreakable, shockproof, nonflammable amber handles, with flange aluminum screw chuck. Blades hardened, tempered and fully polished. In attractive leatherette pouch. NOW ONLY\$1.11 each.

Case of 12 sets.....\$12.00

## NOW! 20" PICTURE FROM YOUR SMALLER SCREEN SETS



Raparco 20" conversion kit at an all-time low price!

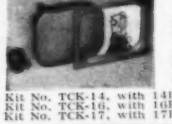
Includes 20CP4 tube, 20" gilt edged mask, matching 70° yoke and 15KV HV transformer. All finest quality components. COMPLETE for.....\$69.95

CHIMNEY MOUNTS—2 piece heavy-duty, rust-proof brackets. No drilling or guy wire needed. Includes strapping. \$1.30 each 12 for \$1.20 each

**Radio Parts Company, 614 RANDOLPH ST., CHICAGO 6, ILL.**

# 17" T.V. CONVERSION KIT ON SALE FOR \$29.95

## CONVERT TO A RECTANGULAR PICTURE



With each conversion kit you get a plastic mask, 70 degree deflection yoke, 50 day guaranteed black face picture tubes, plus our new 7731-X 14,000 Volt Universal fly-back and horizontal output transformer that works on any output tube and any single rectifier (1B3 or 1X2). A suggested diagram is furnished for use of the transformer with several different output tubes and rectifiers. We think this is the most and best priced conversion kit in the country. Shipped Truck or Express, only.

Kit No. TCK-14, with 14HP4 14" rectangular tube. Net price.....\$32.95  
Kit No. TCK-16, with 16HP4 16" rectangular tube. Net price.....\$34.95  
Kit No. TCK-17, with 17HP4 17" rectangular tube. Net price.....\$29.95

## PICTURE TUBE SALE

Values like this 12LP4, \$17.95

Look over these picture tube prices and you will see, that for set replacement and conversion use, McGee offers you more for your money. Every picture tube guaranteed full replacement for 90 days. Every tube is a tremendous value. These tubes are not seconds, but 1st quality.

NOTE: 10MP4 Replaces a 10BP4 Without Any Circuit Changes.

Tube No.	Diameter	Defl.	Overall Length	Neck Length	Envelope	Face	Ion	Net Price
10MP4	10"	54	17 1/2"	7-9 1/16"	Glass	Clear	Single	\$16.95
12LP4	12"	55	17 1/2"	7-9 1/16"	Glass	Clear	Double	17.95
12BP4	12"	55	17 1/2"	7-9 1/16"	Glass	Clear	Single	17.95
14HP4	14"	70	18 1/2"	7-9 1/16"	Glass	Filter	Double	19.95
14BP4	14"	70	18 1/2"	7-9 1/16"	Glass	Filter	Single	19.95
16HP4	16"	70	18 1/2"	7-9 1/16"	Glass	Filter	Double	21.95
16BP4	16"	70	18 1/2"	7-9 1/16"	Glass	Filter	Single	21.95
18HP4	18"	70	18 1/2"	7-9 1/16"	Metal	Filter	Single	24.95
18BP4	18"	70	18 1/2"	7-9 1/16"	Metal	Filter	Double	24.95
18HP4	18"	70	18 1/2"	7-9 1/16"	Glass	Filter	Single	24.95
18BP4	18"	70	18 1/2"	7-9 1/16"	Glass	Filter	Double	24.95
20HP4	20"	70	21 1/2"	7-9 1/16"	Glass	Filter	Single	29.95
20BP4	20"	70	21 1/2"	7-9 1/16"	Glass	Filter	Double	29.95

Note: (R) Designates a rectangular picture tube. 10MP4 perfect for 10BP4.

## BRAND NEW R.C.A. TELEVISION FRONT END-TUNERS

Sale Price \$14.95

A fortunate purchase from a T.V. manufacturer makes a this value possible. RCA 13 channel complete tuner, tested and aligned T.V. tuner. A 13 channel selector switch with outer sleeve fine frequency control. Converter output transformer is attached for direct coupling to video and sound I.F. stages. Shaft length, 33 1/2". Original dealer's price for this item was over \$30.00. McGee offers them to you here new! These have never been solded to or in sets for only \$14.95, less tubes. (3 6AL5 tubes required). Shipping weight 2 lbs. Stock No. RCA-13P, less 3 6AL5 tubes. Net \$14.95, two for \$27.95.

## T.V. BOOSTER REGENCY \$19.10

Regency DB-410 television booster. A well engineered unit, small and compact. A 110 volt, 1-636 tube as neutralized push-pull amplifier. Dollar for dollar, your best booster buy. \$19.10. For 110 volt I.C. 6 lbs. Net price \$19.10.

## NEW UNIVERSAL FLYBACK \$3.95

Why pay up to \$7.50 for a flyback when McGee offers you this new 1051 Universal flyback for only \$3.95 with suggested diagram furnished. A newly designed unit, the 7731-X sweep transformer incorporating a ceramic core, has proven versatile in application to directly viewed picture tube from 8AP4 to 20CP4 designs. It operates at supply levels from 125 to 325 volts with power tubes such as 19HG6-G, 6AU6-GT, 6BD6-GT, or 6BD6-G, and with detector tubes such as 6AS7-G, 6V4-G, or 6V4-G. Within all rating limits to produce accurate sweep and high voltage power with a single 1B3-GT or 1X2 rectifier at 8 kw for the 8AP4 14 degree sweep, or at 14 kw for the 20CP4 17 degree sweep. OR ANY PICTURE TUBE. Rectangular or Round 10", 14", 16", 17", 19". Net \$3.95, 3 for \$11.00.

## NEW 17-INCH TELEVISION KIT TUNER AND VIDEO READY WIRE \$59.95 LESS ALL TUBES

A complete kit of parts to build a transformer operated AC television chassis for use with a 16" rectangular or Round picture tube, with a 12 channel wired Sarkes-Tarzan tuner. The 7 tube video strip for use with sound and picture I.F. stages is already wired, this makes for much less work in building your TV set. Circuit diagram, ceramic flyback, full 225 mva power transformer, ready punched chassis, and a straight forward circuit. A complete schematic diagram is furnished. Only those who understand TV and can follow a schematic diagram should buy this kit. Shipping weight 40 lbs. Model WH-10, less all tubes, \$59.95. Kit of tubes, except picture tube: 6AT6, 6V6, 6V4, 6J6, 2 6AL5, 2 6AL6, 6AG5, 6AG7, 5X2, 1X2, 6BD6, \$16.95 extra. 16" or 17" Rectangular picture tube, \$21.95 extra. Mask is included at no extra cost when kit is ordered with tubes.

## LOOK AT THESE BARGAINS!

### TRAV-LER 3-WAY PORTABLE—\$18.95

A lucky purchase makes this value possible. Model 5022 Trav-Ler 3 way portable. Operates on 105 to 125 volts AC or DC, or self-contained batteries. A full 2 gung superhet with Alnico V dynamic speaker. Tube complement: 1B3, 12A, 12S, 3V4, plus rectifier. Has vernier airplane dial. A smartly styled two-tone portable with ivory plastic front panel and Tan or Red leatherette covered case. Compact size 9 x 5 1/4 x 5 1/4". Loop antenna is built in. Receives broadcast 550 to 1600 kc. A powerful set with 6 tube performance. Shipping weight, less batteries, 6 lbs. (7 lbs. with batteries). Trav-Ler Model 5022, portable less batteries \$18.95. Lots of 3 \$18.50 ea. Battery kit for Model 5022 \$1.75 extra, consists of one 67 1/2 volt 4F and 2 No. 2 flashlight cells.

### VM 3-SPEED AUTOMATIC—\$44.95

Another special purchase offer! VM-975, 3 speed portable automatic record changer. Housed in brown leatherette case: 14 1/2 x 17 1/4 x 8 1/2". Famous VM Tri-O-Matic changer plays all 3 speed and all 3 sizes automatically. 10 and 18 records of the same speed can be inter-mixed. Flip-over crystal cartridge provides the correct needle for the record you are playing. Has good quality 3 tube amplifier, a tone and volume control and heavy magnet PM speaker. Regular dealer net is \$51.60. Now, a limited number are available at the special sale price of only \$44.95 each. Shipping weight 22 lbs.

### TRAV-LER 3-SPEED PORTABLE—\$18.95

Trav-Ler Model 7033, deluxe 3-speed electric portable record player. Powerful 3 tube amplifier, 12SQ7, 50L6, and 3V4 rectifier. Full size Alnico V dynamic speaker. Plays all records: 7", 10" and 12". 33 1/3, 45 and 78 RPM. Crystal pickup. Posse truncated permanent needle. Luczage style case: 12 1/4 x 10 1/2 x 5 1/4". Expertly covered with simulated Tan, Green, or Red leatherette. Shipping weight 11 1/2 lbs. Trav-Ler Model 7033, 3-speed portable electric record player. Net price only \$18.95. Lots of 3, \$18.50 each.

## SARKES-TARZIAN

### 13-CHANNEL T.V. FRONT END

WITH TUBES AND DIAGRAM \$795

This popular Sarkes-Tarzan television front end is widely used by the T.V. industry. The 13 channel rotary switch type with individually tuned coils. Price includes a schematic diagram and 3 tubes, 6C4, one 6BD6, and 6AG5 mixer. Regular factory cost is twice our price. Each tuner and its own tube sockets are wired, ready to hook up to a video and sound IF strip. May be used with either intercarrier or separate sound IF circuits. Built-in fine frequency control. Ship, weight 3 lbs. Sarkes-Tarzan Type 2 TV tuner with tubes net.....\$7.95

Combination deal, Sarkes-Tarzan TV tuner and 205-XX video coil kit, both for.....\$14.95  
Sarkes-Tarzan Type 2—Same as Type 2 only has input IF coil built-in. Tuned for sound IF channel. Net.....\$9.95  
Sarkes-Tarzan Type 3 tuner and 205-XX coil kit both for.....\$16.95



## NEW 2-TUBE SARKES-TARZIAN T.V. TUNER LESS TUBES \$795

Sarkes-Tarzan new two-tube model, type TT-3A, 12-channel television tuner. This is the new two-tube model requiring a 6J6 plus 6AK5 or 6AG5, or 6CT8, or 6AU6 IF tubes. Pre-factory aligned by trained factory personnel. Input feeds 21 MC. broad band. Fine tuning control is over the channel selector shaft. Power requirements 130 to 140 Volts D.C. at 17 Mils plus 6.3 Volt filament. This tuner is offered at a terrific saving to you. Stock No. TT-3A. Net price, \$7.95; two for \$15.00, less tubes. Specify shaft length, desired.

Stock #21-13PX Same as above only not in new condition. Have been in use, but guaranteed good value—less tubes. G. Inst. Tuner—G1-13PX, net \$2.95.

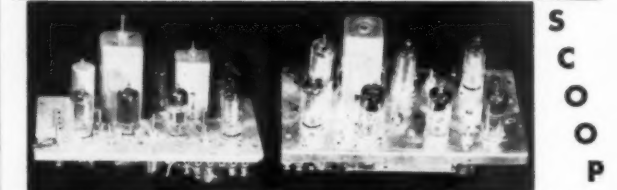
### Video Coil Kit \$7.95

20 matched TV video coil and sound I.F. coils, intended for use with the RCA circuit. You get 6 peaking coils from \$2.75 to \$4.00. A complete video I.F.s, 2-21.25 mc sound I.F.s, discriminator and 5 6AL5, 5 6BD6, and 5 6AG5. ment chokes. Stock No. 205-XX, net \$7.95. \$6.95 if purchased with 5X2 TV tuner, coils included.

### 300-Ohm TV Lead-in 100-Ft. Coil \$2.49

Good quality polyethylene standard flat 700 ohm TV lead-in, 100 feet coil, \$2.49; 1000 feet coil, \$22.49. Good value—less cost for \$6.95. 6c per foot in larger quantities.

WRITE FOR MCGEE'S LATEST BARGAIN FLYER. WHY PAY MORE THAN MCGEE'S PRICE?



## 7-TUBE FACTORY-BUILT VIDEO STRIPS—\$5.95 EACH KIT OF 7 TUBES \$4.95 EXTRA

7 tube, wired, sub-assembly with separate I.F. Stock No. 13C77. Admiral sub-assembly for Model 24D1, etc. Any picture tube from 14" to 20". A complete video sound and video IF strip. This is the most intricate portion of a receiver and offered at less than factory production cost. Requires 7 tubes, 4 6AU6, 6AG5, and 2 6AL5. Only a few connections necessary to any make 12 channel tuner such as Sarkes-Tarzan, G. Inst. Tuner, A. C. Sub-assembly has 1st sound IF (21.25 mc), 2nd video IF cathode trap, 2nd video IF (25.3 mc), 4th video IF (23.15 mc), 2nd sound IF, peaking coil, and ratio detector transformer. Requires 6AL5 video detector and sync clapper, 6AU6 1st sound IF, 6AL6 2nd, 6AL5 ratio detector, and three 6AU6 for 1st, 2nd, and 3rd video IF stages. Printed diagram furnished. Stock No. 13C77. Shipping weight 2 lbs. less tubes \$5.95. Kit of 7 tubes \$4.95 extra.

This 7 tube video sub-assembly was intended for use in Admiral Interceptor type, Model No. 20A1, etc. May be used with any size picture tube up to 20". Offered at less than factory production cost. Requires 7 tubes: 5 6AU6, and 2 6AL5. Now if you want to build a TV set not in the hardest part already finished for you. Used with 10" to 20" picture tube sets. Has ratio detector transformer, sound IF transformer, 2nd video IF (25.3 mc), 3rd video IF (23.1 mc), and 4th video IF (25.13 mc). Requires 6AL5 ratio detector, 6AU6 sound IF amplifier, 6AU6 video amplifier, 6AL5 video detector GAG, and three 6AU6 for 1st, 2nd, and 3rd video IF stages. Printed diagram furnished. Chassis measures 7 1/4 x 3 3/4". Stock No. 13-LAT. Shipping weight 1 1/2 lbs. less tubes \$5.95. Kit of 7 tubes \$4.95 extra.

## 50-WATT BOOSTER AMPLIFIER—\$39.95



50-Watt Morn \$28.50 50-Watt Booster \$39.95 2-Mike Pre-Amp. \$10.00 Extra.

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## Unusual Transmitter

(Continued from page 55)

Then in position 3 connect the microphone and modulate the transmitter. While listening to the signal adjust  $R_{15}$  (near the center of its range) for the cleanest modulation.  $R_1$  controls the sensitivity of the modulated amplifiers. With all of the resistance in the circuit, the most sensitive point is reached.

The drawings in Fig. 6 were copied from oscilloscope pictures of the signal and show some of the various patterns that are possible.

An oscilloscope is not required for adjusting this transmitter, but reasonably accurate peaking of all stages is necessary for proper operation and 100% upward amplitude modulation.

Listening to the signal before all r.f. tuning is completed can be very deceptive as the outputs of all the low level stages will be heard in the receiver at once. For instance, when only one 2E26 is functioning the signal will still appear to be AM because this signal is combined in the input of the receiver with that of the opposite 6AK6 output.

Overmodulation in the conventional sense seems to be impossible, as once the output reaches the combined outputs of both final tubes further increase in modulation causes a decrease in output. Severe negative cut-off with modulation is impossible too, as when the phases are in excess of 180° apart the outputs become additive again. Excessive modulation is not recommended, however, as a 45° shift from each modulator is expecting enough and audio distortion might result if this shift is increased much beyond this point.

The system of modulation used in this transmitter is in widespread use among European broadcasting stations, and should be of interest to serious minded amateurs.

W9MWD is active with this transmitter on the low end of 75 should

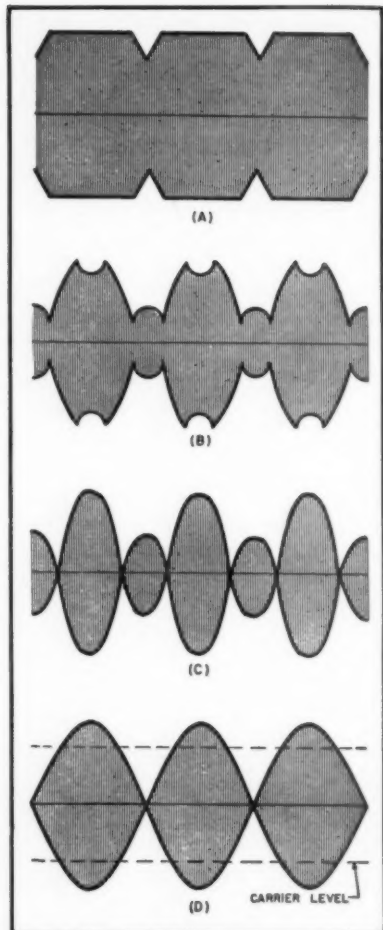
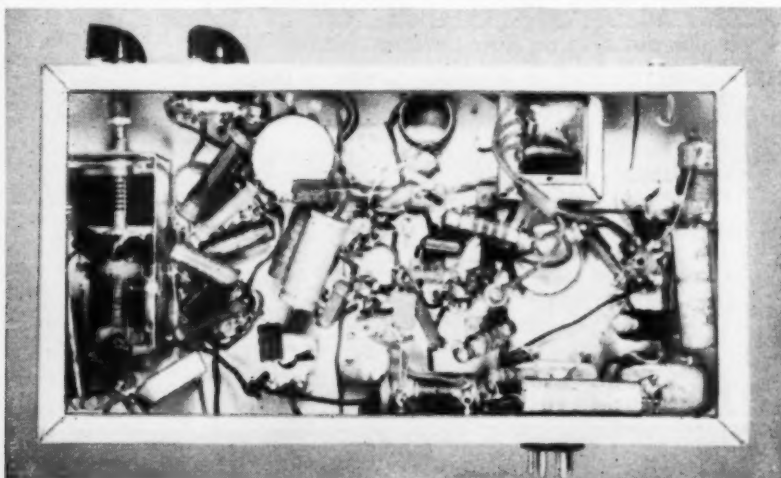
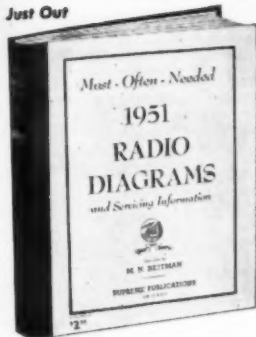


Fig. 6. Various scope patterns obtainable with this unit. (A) Clipping due to excessive phase change in 90-degree phase shift circuit. (B) Transmitter adjusted properly but overmodulated. (C) A phase change in excess of 90 degrees in final amplifiers. (D) 100 per-cent modulation with all of the stages properly tuned.

anyone care to hear it before trying out this system of modulation. —30—

Under chassis view of the W9MWD transmitter which is built on 7x13x2-inch chassis.





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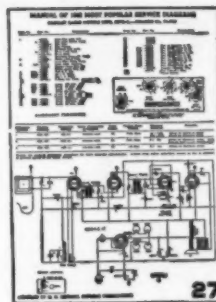
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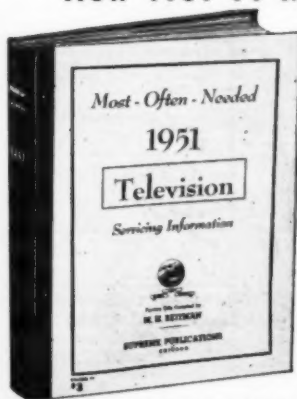
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And best of all—this is not a kit. The phonograph comes to you completely assembled and factory tested. No troublesome wiring. No mistakes. Just plug in—put on the RCA non-breakable records which you get with the outfit and you have dependable entertainment. The amplifier employs 2 tubes, a 50L6 and a 35Z5. Motor is Alliance, the finest. The crystal tone arm is made by Astatic, Shure and Electro-Voice. In addition you get a complete set of RCA Victor non-breakable Children's Records which include such favorites as "Happy the Humbug," "The 500 Hats of Bartholomew Cubbins," "Happanet," "Aladdin and His Lamp," etc. Discs are enclosed in beautifully colored albums giving each story so that the child can follow the recording.

The cabinet is decorated with gay circus figures and the volume can be easily regulated by the large range volume control. Operates on 115 volts AC. Shpg. wt. 15 lbs.

Don't delay, order several now. The price is low enough so it pays to order even for the parts contained. **NO MORE WHEN THESE ARE GONE**

**4 PRONG VIBRATOR.** Popular 4 prong vibrators as used in 90% of auto sets. We promised not to mention the manufacturer's name. Save more than 70%. Guaranteed. Replaces Motorola, Chrysler and any standard 4 prong non-spr. vibrator. Replaces Mallory 2535, 90134 Radiator 5300, 5301. Can also use 1 1/2" x 2 1/2". Reg. List Price \$4.90.  
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Lots of 10, each **\$1.29**

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INSTANTLY ADJUSTED  
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For all auto sets.  
Single, each, 29c  
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## ORDER TV PARTS FROM OLSON

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T-90 Special. While they last, each... **\$2.98**

Latest style combination EM-PM type requiring less power than the straight EM coils. Uses a very heavy Alnico 5 magnet thereby maintaining a more constant focus. This focus coil is used in scores of TV sets including General Electric, Stromberg-Carlson, Air King and many more. Can be used on all 10" and 15" sets. Kinescopes. Here's a real value. Buy now and save. Because of the shortage of Cobalt this will not be available after our present stock is gone.



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Well made ion trap with two powerful Alnico 5 magnets. Exceptionally well made. Bronze spring keeps trap firmly against kinescope neck. Because of the shortage of Cobalt this will not be available after our present stock is gone.



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T-89 Special. While they last, each... **\$1.98**

Genuine focalizers, also known as focus magnets. Provides sharp focus relatively independent of regulation in the voltage power supply. No connections necessary. Widely used in many 1950 models. Utilizes heavy duty Alnico 5 magnets.

**ALLIANCE TV BOOSTER**  
Alliance Booster offers electronic features in design for maximum reception in fringe TV areas. Gives the signal a real boost. One control for all channels. Automatic switch turns Booster on with set. Shpg. wt. 7 lbs.  
RA-62. **\$17.97**

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No.	Size	Watts	lbs.	Each
S-5	5" x 3"	3	1.79	\$1.99
S-6	5" x 3"	3	2.19	\$2.19
S-7	5" x 3"	3	2.19	\$2.19
S-102	5" x 3"	3	2.69	\$2.69
S-111	6 1/2" x 3"	3	3.39	\$3.39
S-98	7" x 3"	3	3.39	\$3.39
S-112	12" x 10"	5	8.95	\$8.95
S-112	12" x 10"	6	9.95	\$9.95

**WOOLER TWEETER**  
design, Resonance 40 to 17,500 CPS

**12" CO-AXIAL SPEAKER**  
Months of research went into the design of these high efficiency speakers. The 12" woofer section is driven by a heavy Alnico 5 6.8 ohm magnet and this part delivers the bass notes. The 3" tweeter which is built into the center of the speaker is driven by a 2.15 ohm Alnico 5 magnet and delivers the treble notes. The high pass filter is built into the speaker and the entire combination gives you tone you never dreamed possible. There are only two wires to connect to any radio or amplifier and the speaker is ready to play. Impedance is 8 ohms. This high quality speaker should be confused with inferior makeshift units. Olson sells these speakers on an ironclad moneyback guarantee if you are not 100% satisfied. Order today. Shpg. wt. 15 lbs.

## NEW 70" TV PARTS—LESS THAN MFG. COST

Positively the hottest bargain Olson ever had. You need these parts for change-over to big pictures as well as for repair jobs.



**Univ. GE Type Flyback RT0-085 (77J)**  
Lots of TEN. **\$3.49**



**70" DEFLECTION YOKE**  
Replacement for RCA 206D1, 206D2, 206D3, 206D4, 206D5, 206D6, 206D7, 206D8, 206D9, 206D10, 206D11, 206D12, 206D13, 206D14, 206D15, 206D16, 206D17, 206D18, 206D19, 206D20, 206D21, 206D22, 206D23, 206D24, 206D25, 206D26, 206D27, 206D28, 206D29, 206D30, 206D31, 206D32, 206D33, 206D34, 206D35, 206D36, 206D37, 206D38, 206D39, 206D40, 206D41, 206D42, 206D43, 206D44, 206D45, 206D46, 206D47, 206D48, 206D49, 206D50, 206D51, 206D52, 206D53, 206D54, 206D55, 206D56, 206D57, 206D58, 206D59, 206D60, 206D61, 206D62, 206D63, 206D64, 206D65, 206D66, 206D67, 206D68, 206D69, 206D70, 206D71, 206D72, 206D73, 206D74, 206D75, 206D76, 206D77, 206D78, 206D79, 206D80, 206D81, 206D82, 206D83, 206D84, 206D85, 206D86, 206D87, 206D88, 206D89, 206D90, 206D91, 206D92, 206D93, 206D94, 206D95, 206D96, 206D97, 206D98, 206D99, 206D100. **\$2.99**



**Deflection Yoke for use with 10B14, 12L14, 16A14 and all similar kinescopes, same RCA 205D1, WT. 2 1/2".**  
T-84. Ea. \$2.79. Lots of 3... **\$2.29 ea.**



**300-Ohm Lead-in**  
High grade, low loss. For all TV installations. Shpg. wt. 3 lbs. **\$3.33**  
Ea. Lot of 10 Each **\$4.00**



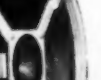
**Hi-Voltage Flyback**  
output transformer. Provides 9KV. Same as RCA 211T1. WT. 4 1/2". **\$2.99**  
Lots of 3 each only



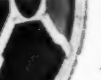
**3 SPEED PICK-UP ARM**  
Cartridge flaps by means of these high efficiency speakers. With dual cartridge, one side pickup and 45 and other 78 RPM. Double tone included. **\$4.95**  
M-64 Each



**PICK-UP ARM**  
With crystal bridge. Plays all 78 RPM records. **\$2.99**  
Ea. Lot of 10 Each



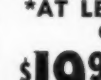
**12" CO-AXIAL SPEAKER**  
Months of research went into the design of these high efficiency speakers. The 12" woofer section is driven by a heavy Alnico 5 6.8 ohm magnet and this part delivers the bass notes. The 3" tweeter which is built into the center of the speaker is driven by a 2.15 ohm Alnico 5 magnet and delivers the treble notes. The high pass filter is built into the speaker and the entire combination gives you tone you never dreamed possible. There are only two wires to connect to any radio or amplifier and the speaker is ready to play. Impedance is 8 ohms. This high quality speaker should be confused with inferior makeshift units. Olson sells these speakers on an ironclad moneyback guarantee if you are not 100% satisfied. Order today. Shpg. wt. 15 lbs.



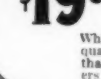
**3-SPEED RECORD PLAYER**  
\*AT LESS THAN THE COST OF THE PARTS  
**\$19.97**  
YOUR SPECIAL PRICE FROM OLSON'S Model RA-56



While they last Olson offers these high quality 3-speed record players at less than the cost of building one. The players were made for a nationally famous store and Olson was able to get one thousand to move at this fantastically low price.



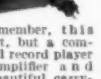
\*Look what the parts would cost if bought separately even at our SPECIAL SALE PRICE.



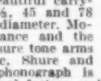
Remember, this is not a kit, but a completely assembled 3-speed record player with built-in 2-tube amplifier and a d speaker, housed in a beautiful carrying case. Plays all 33 1/3, 45 and 78 RPM records up to 12" diameter. Motors are made by Alliance and the finely balanced low pressure tone arms are supplied by Astatic, Shure and Electro-Voice. Every phonograph is 100% guaranteed. Original factory-sealed carton. Operates on 115 volts AC. Shpg. wt. 15 lbs. Don't delay, order several now. The price is low enough so it pays to order even for the parts contained. **NO MORE WHEN THESE ARE GONE**



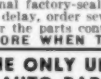
3 Speed Motor.....\$ 5.99  
3 Speed Phono Arm..... 4.95  
Omnium Tipped Needle..... 4.95  
Amplifier..... 3.98  
Set of Tubes for Amplifier 1.69  
PM Speaker..... 1.29  
Output Transformer..... .69  
Set of Knobs..... .24  
AC Cord..... .29  
Portable Case with Cover. 5.49  
Total.....\$35.11



**PHILCO 1951 AUTO RADIO— THE ONLY UNIVERSAL ONE-PIECE AUTO RADIO FOR ALL CARS**



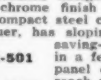
A brand new Philco 6-tube super-het auto set with 30% more undistorted sound output for rich, clear-voiced volume and greater range. New 3-gang permeability tuner. Built-in interference filtering.



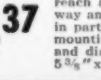
New streamlined design, with slide-rule dial encased in gleaming chrome finish to harmonize with modern cars. Rugged, compact steel case finished in dark blue hammer-type lacquer, has sloping front-end, attractive, space-saving—out of passenger's way. Installed in a few minutes beneath the instrument panel of the car. Controls are easy to reach and use. Yet it is out of the way and virtually out of sight like a built-in part of the car. Complete with tubes, mounting bracket, generator condenser and distributor suppressor. Size: 5 1/2" x 5 1/2" x 7 1/4". Shpg. wt. 20 lbs.



**Model CR-501**  
**\$34.37**



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**RADIO & TELEVISION NEWS**





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Order from your Parts Jobber or write direct to  
HOWARD W. SAMS & CO., INC., 2201 E. 48th St., Indianapolis 5, Indiana

**HOWARD W. SAMS & CO., INC.**

## TV Pictures in Color

(Continued from page 40)

to the scanning lines as it moves down the screen. In order to accomplish this, it is necessary for the filter segments to be distorted, like those shown in Fig. 3, because the scanning raster is rectangular and the filters revolve. These segments are distorted in such a manner that it is impossible for any line or group of lines to be observed through the wrong filter.

A typical color disc assembly, with a manually synchronized motor, is shown in Fig. 3. As with all rotating discs it is intended to be used directly in front of the picture tube. In this instance, the maximum diameter of the disc will depend on the picture tube being used. It is possible, however, as an experimental procedure only, by pulling the disc away from the picture tube, i.e., closer to the viewer, to use the same size disc with a larger picture tube. Thus, by reducing the distance between the viewer and the rotating disc and increasing the distance between the disc and the picture tube, a 12" color disc can be used with, say, a 12" or even larger picture tube.

The motor to be used is a split-

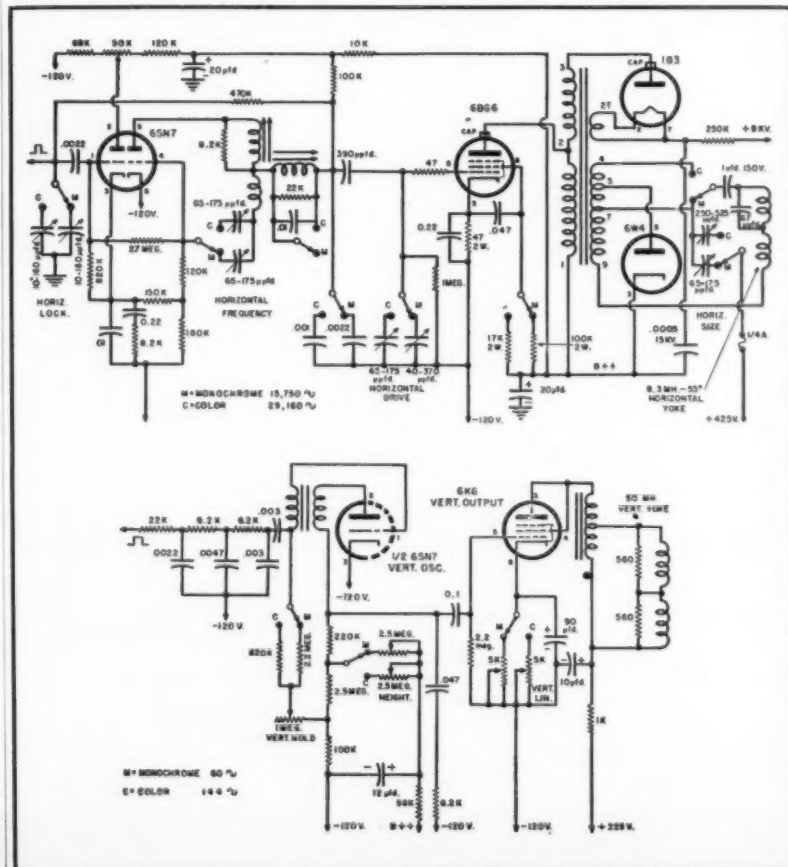
phase induction type of approximately 1/10 to 1/50 horsepower, depending on the size of the disc to be driven. Many phono motors available today are of this type. They rotate at approximately 1800 rpm. For proper color synchronization the motor must be driven at 1440 rpm. This can be done either by gearing down or using a friction drive. By varying the voltage on the motor or by inserting a rheostat in the line, it is possible to obtain a vernier action. The speed of a motor of this type varies in relation to the applied voltage.

Manually controlled systems of this type will hold synchronization for reasonable periods. They do, however, require frequent readjustment. It does provide an inexpensive method for obtaining color.

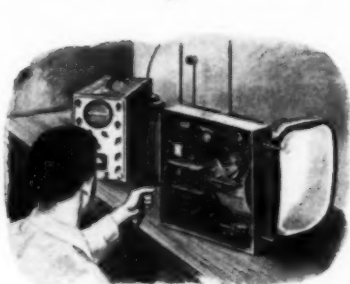
There are several commercial methods of electronically synchronizing the color disc with the transmitter. One of these systems operates by comparing the output of the vertical sweep amplifier with the 144 cycle signal coming from the rotating motor. Any difference between these two signals causes a magnetic brake to act and adjust the speed of the motor. More details on systems of this type will be covered in future issues of RADIO & TELEVISION NEWS.

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Fig. 5. An RCA 9T246 television receiver that was converted by Columbia engineers to provide dual-frequency operation. Both conventional black and white and CBS color signals (in monochrome) can be received by simply flipping a panel switch.



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## ...here's a quick and easy way to train them

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## RCA INSTITUTES, INC.

A SERVICE OF RADIO CORPORATION of AMERICA  
350 WEST FOURTH STREET, NEW YORK 14, N.Y.

August, 1951

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Home Study Department, RN-851  
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1B31..... 32.50	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B32..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B33..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B34..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B35..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B36..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B37..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B38..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B39..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B40..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B41..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B42..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B43..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B44..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B45..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B46..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B47..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B48..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B49..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B50..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B51..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B52..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B53..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B54..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B55..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B56..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B57..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B58..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B59..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B60..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B61..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B62..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B63..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B64..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B65..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B66..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B67..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B68..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B69..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B70..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B71..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B72..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B73..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B74..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B75..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B76..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B77..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B78..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B79..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B80..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B81..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B82..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B83..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B84..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B85..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B86..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B87..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B88..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B89..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B90..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B91..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B92..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B93..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B94..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B95..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B96..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B97..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B98..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B99..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15
1B00..... 3.95	3HP7..... 3.95	304TH..... 27.50	832A..... 12.95	C82..... 1.45	1A6T..... 1.10	0A8T..... 1.45	6SR7..... 1.45	14F7..... 1.15

### FULL-WAVE SELENIUM RECTIFIER STACKS

Max. A.C. Max. D.C. Full Size Amps. Output This Price  
Input Volts Output in Inches Continuous Number

SINGLE PHASE BRIDGE				
0-18 0-14.5	1A	1.3	1884D1S1	\$ 3.95
2-3 1/2	1A	2.4	1884E1S1	4.95
3-4	1A	0.6	1884F1S1	7.95
4-5	1A	13.0	1884G1S1	12.95
5-6	1A	17.5	1884H1S1	19.45
6-7	1A	26.0	1884I1S1	22.50
7-8	1A	30.0	1884J1S1	27.50
8-9	1A	52.0	1884F1S3	47.50
9-10	1A	70.0	1884J1S1	70.00
0-40 0-34	1 1/2	0.60	40B4D1S1	4.95
2-5 1/2	3/4	1.2	40B4E1S1	6.95
3-6 1/2	3/4	3.2	40B4F1S1	14.95
4-7 1/2	3/4	9.0	40B4G1S1	17.50
5-8 1/2	3/4	18.0	40B4H1S1	24.50
6-9 1/2	3/4	26.0	40B4I1S1	32.50
7-10 1/2	3/4	34.0	40B4J1S1	44.50
8-11 1/2	3/4	36.0	40B4J1S3	82.25
0-120 0-100 1/2	1 1/2	0.60	40B4D3S1	12.45
2-15 1/2	3/4	1.2	40B4E3S1	14.95
3-20 1/2	3/4	3.2	40B4F3S1	24.50
4-25 1/2	3/4	9.0	40B4G3S1	29.50
5-30 1/2	3/4	9.0	40B4J3S1	43.50

## WANTED! WANTED!

ATTENTION colleges, schools, buns, industriale!! Highest prices paid for surplus equipment, parts, and tubes. We are especially looking for test equipment TS-12, 13, 35, 14/AP, 15/AP, 146/TP, 173, 174, 175, 239, 259, 263. Any types with TS prefix. Write, wire or call.



## WANTED! WANTED!

APR-4, 5, 7 and tuning units. ARC-1, 3, ART-13, ATC, APS-10, microwave equipment in S, K, X-band. APS-15, APQ-13, APS-13, SCR-300, 284, 694, etc. BC-221, 342, 348, BC-1016 tape recorders. Write, wire or call.

# RADAR—COMMUNICATIONS AND TEST EQUIPMENT

TS-35/AP X-band Signal Generator. Pulsed and C.W. freq. range. 8400-9600 mcs. This unit will measure power and frequency. 115v 60-2600 cye.

TS-3/AP S-band Frequency and Power Meter. Portable. Battery operated. Complete with all cables. TS-33/AP X-band Frequency Meter. 8500-9600 mcs. Contains crystal detector and indicating meter. Output to scope will indicate pulse wave shape.

TS-62/AP X-band Echo Box. 8400-9600 mcs. tuned and untuned input. Will indicate resonance on meter. Complete with pick up antenna and cable.

TS-269/UP Crystal Diode Test Set. Used to check IN21, IN22, IN23, etc. Battery operated. Portable. Complete with spares.

TS-89/AP Voltage Divider. 1:10 and 1:100 ratios. Wide band for true pulse shape. Output to scope. TS-10/AP A-Meter Test Set. Good condition. Complete with cables and dummy antenna \$35.00

TS-12/AP V.S.W.R. Test Set for X-band. Complete with amplifier, slotted line, termination, adaptors, etc. In 2 carrying cases. Excellent.

TS-45/APM-3 X band signal generator. 8400-9600 mcs pulsed & CW output. Used to check AP84 and similar sets.

TS-36/AP X-band Power Meter. Consists of power measuring circuit. Horn antenna, co-ax to wave guide adaptor, connecting cable and probe. Will measure either absolute or relative power. Nominal band of usefulness is approx. 8.5-9.7 KMC. Excellent condition.

TS-118/AP R.F. Wattmeter for the range of 20-750 mcs. Will measure power up to 500 watts. Complete.

TS-174/U Freq. Meter. Freq. range is 50-250 mcs. High freq. version of BC-221. Excellent condition. \$385.00

1-185 Signal Generator. S-band. S-band track. Used with SCR-545 and similar sets. Complete with cables. Good condition.

TS-61/AP S-band Echo Box. Using meter provided it is possible to measure the V.S.W.R. adjustment and determine relative power output. Complete with probe and cable. Very good condition.

TS-13/AP X band signal generator, wave meter, wattmeter. Precision lab microwave. Test set. Will provide either pulsed or CW output in X band. Input 115v 60-800 cye.

TS-226/AP used to measure peak power output of any xmitter in the range of 200-1000 mcs. Has provision for oscilloscope signal observation and built in calibration. Part of AN/APM-29. Excellent.

TSN-45E X-band spectrum analyzer. Unit will analyze magnetron & klystron output from 8400-9600 mcs. Double moding, pulling, sparking, etc., can be observed. 115v 60 cye input.

TS-14/AP consists of S-band signal generator, freq. meter, wattmeter and cables. Power input is 115v 50-2600 cye. Used to check various S-band radars and beacons.

TS-170/ARN-5 XTAL controlled test use, with the following freq. ranges: 332.6, 333.8, 335.0 depending on XTAL in use. This set is used to align glide path receivers. Batteries and antenna are self contained. Excellent condition.

AN/AP8-3 Airborne X-band Search and Homing radar. Complete. Contains RF head, modulator, synchronizer, control boxes, plugs, antenna, etc. 115v 400 cye. Excellent condition. \$875.00

ASB-5 L-band Search and Homing radar. Complete. Contains xmitter, receiver, power unit, control box, plugs, etc. 115v 400 cye. Excellent condition. \$125.00

SCR-518 Radar Altimeter. 500 mcs. equipment. Complete with xmitter, receiver, control box, power unit, function box with all cables, racks, etc. Unit will indicate altitude up to 50,000 ft. Power input is 28v. New condition. \$99.50

AN/AP8-15 R.F. Head and Modulator. X-band. Complete with all tubes. Good condition. \$99.50

AN/APA-23 Automatic Signal Strength and Time Recorder. Unit will scan a receiver thru its range and record all signals on electrostatic paper. Input is 115v 60-2600 cye. and 28v DC. Excellent condition. \$175.00

## DYNAMOTORS AND POWER UNITS

Type	Input Volts	Output Volts	Amps	Price
DM-19	12	500	.200	\$ 6.95
PE-125	12v/24v	475	.200	14.50
DM-32	28	250	.060	1.75
DM-33	28	570	.160	2.95
DM-34	12	220	.040	8.95
DT-12	12	465	.110	5.00
PE-73	28	1000	.350	10.00
PE-94	28	300	.260	
		150	.010	2.25
		14.5		8.95
PE-97	Vibrator	Power Supply		35.00
PE-98	12v	300v		
PE-101	28	400		5.75
PE-103	6 & 12	500	.160	35.00
PP-18-AR	Vibrapak			15.95
RA-42	Inverter	(for BC-639 Receiver)		29.95
ATR	12v	110v AC	125 watts	14.95

PHONE DIBBY 9-0347

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AN/CRT-3 Victory Girl. Dual frequency emergency lifeboat xmitter. Complete with xmitter, kite hydrogen generator, etc. New in knapsack. C.A.A. approved. \$69.50

AN/APR-5 Radar Search Receiver. Freq. range 1000-3100 mcs. Will detect signals up to 10,000 mcs. with reduced sensitivity. Contains oscillator and mixer cavity, IF strip, power supply. Input 60-2600 cye. 115v. Excellent condition. \$375.00

T-50 Radiotelegraph Transmitter complete with power supply and all accessories with spares. Portable. New in cases. \$275.00

AN/APT-5 300-1500 mcs. xmitter cavity oscillator using 3C22 lighthouse tube. Power output 30 watts. Noise modulated. Excellent condition. Complete with all tubes. \$149.50

SK-1M Radar Receiver Indicators. Freq. 195 mcs. 2 R.F. stages, 3 IF stages. 1 video, etc. New condition. \$125.00

SCR-183 Airborne Command Equipment. Freq. range 201-398KC and 2500-7700KCS. Complete. Contains receiver, xmitter, dynamotor, antenna switch, control box, coils, etc. New in knapsack. Manufactured by Western Electric. \$125.00

NAVY RU Command Equipment. Similar to SCR-183. \$125.00

DU-1 Direction Finding Equipment for SCR-183 and RU Series Equipment. Can be used with any receiver for direction finding in freq. range 200-1600KC. New. Complete. \$45.00

SCR-515 (BC-645) contains xmitter, receiver, dynamotor PE-101, control box, manual, etc. New. \$125.00

AN/PPN-1 EUREKA! Ground portable beacon responder. Unit will work into the AN/APN-2 transponder for purposes of homing. C.W. communication can also be carried on between plane and ground. Unit comes complete with xmitter, receiver, power pack, phone, etc. Brand new in knapsack. AN/APN-2 EQUIPMENT CAN BE SUPPLIED ON ORDER.

SCR-269/G Automatic Radio Compass. Freq. range 200-1750KC. Complete with BC-433-G receiver, BC-434, LP-21, 1-81, 1-82, BK22, etc. Very good condition. \$129.95

SCR-300 Frequency Modulated Transceiver. Freq. range 40-18 mcs. Complete with 15 tube hand set and antenna. Powered from self contained battery pack. Excellent condition. Weight approx. 35 lbs. with battery, each. \$275.00

TCS Marine Radio Telephone and Telegraph Xmitter and Receiving Equipment. Freq. range 160-12000KC. Consists of xmitter, receiver, antenna loading coil, remote control box, power unit, cables, etc. Power input is 12 or 32v DC. We can supply an 110v AC power supply for stationary use at additional cost. Excellent condition.

SCR-536 Xmitter-Receiver (handy talkie). Freq. range 3885-5500KC. Complete with coils, tubes, crystals. Very good condition. \$89.95

AN/APA-10 Panoramic Adaptor for use with any receiver with following H.F. complete with 30 mcs. Unit will give panoramic presentation (1 mc wide for 455KC input) (100KC for 5MC input) (23MC for 30 mcs input). Power input 115v 400 cye. but can be changed with the addition of a proper power transformer. Excellent condition. \$175.00

10 CM R.F. package. 2700 mcs. Consists of BC-1007 modulator & BC-1091 RF head. Power output approx. 40 KW. Complete with tubes. \$195.00

RT-39 APG-5 10 CM LHTR R.F. head & modulator. Low power approx. 2 KW. Lighthouse tube rec & trans w/T.R. tunable. New. \$135.00

SCR-510 Freq. Modulated Portable Transceiver. Covering range of 20.0-27.9 mcs in 80 channels 100KC apart. Complete equipment consisting of BC-620 transceiver, power supply PE-97A, T-17 mike, handset, AN-45 antenna, battery operated or 6 or 12v input. Excellent condition. \$69.95

SCR-610 similar to SCR-510 except for freq. range which is 27.0-38.9 mcs. Excellent condition. \$79.95

AN/APA-11 Pulse Analyzer to work with Search Receiver for analysis of received pulsed signals. PPS, pulse width, wave shape, can be displayed on an CR tube. Unit can also be used as a standard oscilloscope for general servicing work. Input is 115v-400-2600 cye. but can be changed with the addition of a 60 cye. transformer. Very good condition.

SCR-694 Field Radio. Light weight version of SCR-284. Freq. range is 3.8-6.5 mcs. Power output is A1-20, A3-5; comes with transceiver BC-1306, GN-45 or 58 band generator, antenna system, microphone, headset, etc. In excellent condition.

PE-237 AC Power Supply for stationary use can be supplied at additional cost.

SCR-522 VHF Airborne Command Equipment. Freq. range 100-156 mcs. in 4 channels receiver and transmitter. Crystal controlled. Complete equipment. Consists of Trans/rec, control box BC-602, dynamotor PE-94, AN104A antenna, plugs, etc. Power input with PE-94 is 28v. Excellent condition. We can supply PE-98 dynamotor for 12v input at additional cost.

## COMMAND EQUIPMENT

### ARC-5 274N OTHERS RECEIVERS

ARA 500-1500KC. New. \$24.95  
453B 200-550KC. Good. 19.95  
455B 6-9 mcs. Good. 19.95  
433 200-1750KC. Good. 29.95  
ARR-2 234-258 mcs. New. 19.95

### TRANSMITTERS

459-A 7-9.1 mcs. Good. \$19.95  
696-A 3-4 mcs. New. 29.95  
TYPE O 5.3-7 mcs. New. 9.95  
AVT-23 3000-13,000KC complete w/control box, manual, etc. C.W. or phone. 14 or 28v input. Brand new. Original cases. 79.50  
BC-950A 100-156 mcs. New. 89.95

### ACCESSORIES

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BC-442 Relay Unit (ANT.). Used. 1.95  
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AN/104A Antenna for SCR-522, ax handle. New. 3.95  
BC-128 Lighthouse Tube Preamp. Excellent. 69.95  
ASB 500 mcs YAGI Antenna Dual 6 Element Single 5 Element. 14.95  
AN/APN-2 Radar Direction Finding. 8.95  
Antenna, back to back parabola, freq. range 300-1000 mcs. Horizontally and vertically polarized. Excellent. 59.00  
BC-936 Interphone Amplifier. Good. 9.95  
ART-13 Loading Condenser. Excel. 4.95  
CW-3 less coil & crystals. New. 29.50  
CU-25 Loading Box for ART-13. 49.95  
AS-27/ARN5 Antennas. Very good. 3.95  
SA-1/ARN-1 Part of ARN-1. Very good. 2.95  
1D-80/APA-17 Indicator. Excel. 129.95  
RBM-4 Receiving Central. Complete with all power supplies, carrying case and cables. New. 325.00  
AVR-15 Aircraft Receiver. Very good. 19.95  
BC-923 Receiver. Very good. 39.95  
BC-806 Xmitter/Receiver. Very good. 39.95  
RA-300 FM Exciter (Mig. Tempco). New. 32.50  
A-55 Dummy Antennas. Very good. 2.25  
BC-1365 Control Box. Good. 3.95  
FL-8 Filter. Less cables. Fair. 2.65  
3C-16-D GSAB Gun Camera Computers with all access. In carrying case, Excel. 19.95  
AT-24/APN-2 Antenna. Fair cond. 4.95  
Spare for ARC-5 and 274N. APN-1, Antenna. We have a large stock of TS-34A/AP Spares.

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CG-(172/173) CPN-8 CM Coax Patch Cable. New. \$4.95  
CX-548/CRD-3 Cable. New. 1.25  
CX-546/CRD-3 Cable. New. 1.25  
CD-508A w/SW 14-U & 2 Cord Attachments with JK-48 Jack & PL-68 Plug. New. .75  
CD-307A with PL-55 and JK. New. 1.29  
PL-55 Plug. New. .49  
83-168 Adapter. New. .17  
83-15P Connector. New. .17  
83-1R Coax Connector. New. .69  
83-1AP Angle Coax Connector. New. .22  
83-12 Feed Thru. New. .90  
83-1F Feed Thru. New. 1.30

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0-5, 10, 50, 100, 500, 1000, 5000. Input impedance: 20 megohms (including 10 megohms in the DC probe)

### AC VOLTS

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Input impedance: 10 megohms

### OHMS

0 to 1000 megohms in 6 ranges with center scale readings of 10, 100, 1000, 10K, 1Meg., 10Meg.

### CAPACITANCE

50 MMF to 5000 MF in 6 ranges. Low voltage power source enables testing of electrolytic condensers.

### MILLIAMPERES

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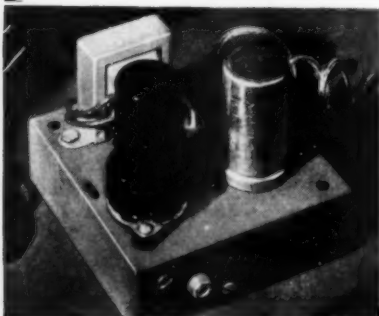
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**39 E. 47TH ST., NEW YORK**

## Sound Engineering

(Continued from page 66)

of the acoustics of hundreds of theaters throughout the United States, and then setting a recording characteristic that could be reproduced with good results in the average theater. Also, theater projection equipment is maintained at a certain characteristic so that the best results will always be obtained.

It is the policy of the major motion picture studios to completely re-record the sound before releasing, at which time frequency corrections and levels are ironed out for a uniform product. During this process a low-pass filter having the characteristics of the *average* theater is used in the monitor system so that the final product, from a listening standpoint, will be similar to that heard in the average theater.

This brings us up to a point that the television industry might well consider: Kinescope and produce motion pictures for television with a frequency characteristic that is the most suitable for television listening, based on the average acoustic response of the listening home. Also provide the manufacturers of television receiving equipment with specifications on a two or three position equalizer with a cut-off frequency characteristic suitable for both 16 mm and 35 mm film reception and straight FM sound.

To carry this a step further, television stations should attempt to transmit the sound track with a standard frequency response so that the listener with a receiver so equipped would obtain the best results.

The control in the television receiver should be so designed that both the low and high frequencies are properly compensated to maintain the proper aural balance. The control would be labeled, "FM, Film: 1,2,3."

As the listener would have no way of knowing what type of film was being transmitted, he would select the position that gave the best reproduction. Of course this would not fit all situations, but would be an improvement over the condition as it now exists.

At present the situation may be likened to that encountered in disc recording, a situation which is being cleared up rapidly with the cooperation of the recording activities and the manufacturers of record reproducing equipment.

Next we have the studio microphones which may be used for announcing, sound effects, or music pickup. If the studio pickup involves music, vocal, and dialogue, separate microphones may be required. The dialogue microphone should have the low frequency end reduced approximately 3 to 6 db at 100 cycles to remove any "tubbiness" in the voice. If the microphone is a ribbon velocity, this may be done by connecting the "voice filter" in the microphone, or attenuating the low frequencies at the mixer console. (High and low frequency attenuation will be discussed later with the mixer.)

**RADIO & TELEVISION NEWS**



# RELAYS FOR EVERY PURPOSE



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This is only a partial list. Write or wire us for information on types not shown.

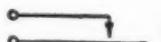
STANDARD DC TELEPHONE RELAYS					W-E TYPE "E" RELAYS					Stock No. Voltage Ohmage Contacts Unit Price					
Stock No.	Voltage	Ohmage	Contacts	Unit Price	Stock No.	Voltage	Ohmage	Contacts	Unit Price	Stock No.	Voltage	Ohmage	Contacts	Unit Price	
R-868	30/162 VDC	3300	1C	\$1.90	R-910	...	6.35 35 35	2A Split Cont.	\$3.50	R-931	7.5 VDC	20	1A @ 250 amps.	\$5.50	
R-873	6	12	3C, 3A Micalex	3.00	R-904	...	35, 175	1A	1.25	R-932	24 VDC	160	1A @ 50 amps.	4.05	
R-918	52/228 VDC	6500	1C	1.40	R-901	12 VDC	270	2B-2C	1.50	R-940	24 VDC	132	1A @ 200 amps.	5.50	
R-852	52/228 VDC	6500	1C, 1A	1.55	R-870	24 VDC	2600	1A	1.30	R-879	24 VDC	150	1A @ 50 amps.	3.75	
					R-878	24 VDC	2600	1A	1.30	R-874	24 VDC	140	1A Dbl. Brk. @ 25 amps.	2.80	
					R-863	48 VDC	4000	3A	2.00	R-945	12 VAC	1	2A @ 30 amps.	1.25	
<b>SHORT TELEPHONE RELAYS</b>					<b>SLOW ACTING</b>					R-946	125 VDC	3200	2A @ 30 amps.	2.75	
R-907	24/32 VDC	3500	1C	2.00	R-897	6 VDC	150	1A Slow Break	2.65	R-960	115 VAC	175	2A @ 30 amps.	5.95	
R-914	110 VAC	200	3B	2.50	R-865	24 VDC	200	1C Slow Break	1.75	<b>MIDGET RELAYS</b>					
R-908	6 VDC	15	4A @ 4 amps.	1.50	R-934	24 VDC	3000	2B Slow Break	2.95	R-857	24 VDC	260	1D	1.75	
					R-962	6 VDC	150	1A Slow Make	2.65	R-912	4.5 VDC	20	3A-1C Ceramic	1.45	
<b>KEYING RELAYS</b>					<b>DIFFERENTIAL RELAYS</b>					R-921	6.7 VDC	18	1A Dbl. Brk. @ 10 amps.	1.45	
R-950	12 VDC	450	1A @ 1.5 amps.	1.50	R-849	220/250 VDC	8000	2C	3.65	R-922	12 VDC	75	10 amps.	1.45	
R-935	28 VDC	1000	1C @ 1.5 amps.	1.65	<b>SEALED RELAYS</b>					R-893	14 VDC	150	1A, 1C	2.50	
R-940	2.4 VAC	...	1A @ 5 amps.	1.95	R-861	32 VDC	8000	1B	4.00	R-895	14 VDC	150	2A, 1B, 1C	2.50	
R-891	24 VDC	475	1C @ 5 amps.	1.45	<b>VOLTAGE REGULATORS</b>					R-896	24 VDC	260	3A, 1C	2.50	
R-859	27.5 VDC	250	1A Dbl. Brk.	1.45	R-986	6 VDC	1	3 Terminal	2.25	R-894	24 VDC	260	3A, 1C	2.50	
R-931	6.5 VDC	1300	2C	3.05	R-886	6 VDC	1	with 15 ohm 50 watt	1.95	R-856	18.24 VDC	300	1B	1.45	
R-960	24 VDC	230	3C @ 15 amps.	2.95	<b>CONTACTORS</b>					R-913	5 VDC	20	3A, 1C Ceramic	1.45	
R-828	6.8 VDC	42	1A	1.50	R-890	24 VDC	60	1A @ 10 amps.	3.45	R-915	12 VDC	70	10 amps.	2.00	
R-855	110 VAC	160	1A Dbl. Brk. @ 15 amps.	3.25	R-916	24 VDC	80	1A @ 25 amps.	2.95	R-834	6 VDC	20	3A, 1C	1.45	
R-948	110 VAC	330	3A @ 15 amps.	3.00	R-885	24 VDC	120	1A @ 25 amps.	3.00	<b>SPECIAL RELAYS</b>					
R-924	12 VDC	72	1C Dbl. Brk.	1.65	R-845	220 VAC	...	3A	4.50	R-846	5.8 VDC	19	1C Coax	6.95	
R-950	2.4 VAC	...	1A @ 8 amps.	2.25	R-838	90/120 VDC	925	2A	4.50	R-920	8 VDC	18	1A @ 25 amps.	1.25	
R-978	6 VAC	1.7	1A @ 1.5 amps.	1.95	R-842	115 VDC	925	3A	5.50	R-931	Min. 1.5 Ma.	150	1C @ 12 1/2 amps.	7.50	
R-979	6 VAC	1.7	2A @ 1.5 amps.	1.95	R-840	115 VDC	1200	2A - Size 1	5.50	R-927	220 VAC	2500	1A @ 5 amps.	15.00	
R-917	18 VAC	31	1A @ 12 amps.	1.75	R-842	115 VDC	1200	3A-1B (Aux.)	4.50	R-951	115 VAC	...	1/2" Stroke	1.45	
R-965	24/30 VAC	38	1A @ 1.5 amps.	2.25	R-841	115 VDC	1200	3A-1B (Aux.) Size 2	4.00	R-887	5 Adj. 1.5 Amp. 40	...	2 Pole 2 Pos.	27.50	
R-966	24/30 VAC	38	2A 2B @ 1.5 amps.	2.25	R-980	24 VDC	6	1A @ 250 amps.	5.50	R-932	6 V. @ 112 amps.	...	12 V. @ 56 amps.	4.25	
R-967	24/30 VAC	38	2A 3B @ 1.5 amps.	2.48	R-842	24 VDC	40	1A @ 200 amps.	3.95	R-930	25.50 VAC	25 ea. coil	2B-1H @ 8 amps.	3.75	
R-968	24/30 VAC	38	1A 5B @ 1.5 amps.	2.55	R-844	115 VDC	1200	3A-1B (Aux.)	4.50	R-972	40.50 VAC	...	1B @ 12 1/2 amps.	1.25	
R-969	24/30 VAC	38	1A 6B @ 1.5 amps.	2.70	R-943	115 VAC	100	4A-4B @ 10 amps.	6.75	R-258	26 VDC	65	1 MBM @ 1 1/2 amps.	18.95	
R-974	24/30 VAC	48	1A 1B @ 1.5 amps.	2.25	R-941	14 VDC	12	1A @ 200 amps.	4.05	R-906	40 VDC	600	1A @ 30 amps.	3.95	
R-971	24/30 VAC	48	1A 2C @ 1.5 amps.	2.40	R-956	28 VDC	160	1A Dbl. Brk. @ 50 amps.	4.95	R-864	24 VDC	95/95	1A, 1B, 1C/1A, 1B, 1C	5.50	
R-973	24/30 VAC	48	2A @ 1.5 amps.	2.25	R-880	18.24 VDC	375 C.T.	1A Dbl. Brk.	2.50	R-847	10.15 VDC	70	4C	4.75	
R-970	24/30 VAC	48	1A 1C @ 1.5 amps.	2.40	R-889	18.24 VDC	160	1A Dbl. Brk.	2.50	R-964	220 VAC	...	2A Dbl. Brk. @ 3 KV.	8.95	
R-975	24/30 VAC	48	1B 1C @ 1.5 amps.	2.40	R-899	24 VDC	70	1C @ 50 amps.	2.50	R-952	24 VDC	175	1A-Grounded	2.95	
R-976	24/30 VAC	48	2C @ 1.5 amps.	2.55	R-898	28 VDC	8	1A @ 200 amps.	4.50	R-884	12 VDC	670	12 Pos. Rotary	12.95	
R-977	24/30 VAC	48	3A 1C @ 8 amps.	2.70	R-909	24 VDC	11	1A @ 250 amps.	5.50	R-902	115 VAC	...	440 VAC	1A @ 25 amps.	...
R-881	115 VAC	1200	1A 1C 1D	2.80	R-937	24 VDC	150	1A @ 50 amps.	4.75	R-957	Adj. from 1 Ma. 6200	1C	115 VAC	87.50	
R-853	6.8 VDC	30	2A @ 10 amps.	3.55	<b>Wide Selection of Electronic Components at</b>					R-957	12 VDC	5	1B 2 Aux. Cont.	1.50	
R-875	6.8 VDC	240	1C @ 12 amps.	1.50	<b>WELLS</b>					R-919	6.8 VDC	50	1C	5.25	
R-830	24 VDC	330	2A	1.45	<b>Resistors</b>					R-911	40 VDC	200	1C @ 20 amps.	2.95	
R-832	24 VDC	375 C.T.	1A @ 15 amps.	1.70	<b>Relays</b>					<b>TYPE 82</b>					
R-939	24 VDC	747	2C	1.50	<b>Condensers</b>					Stock No.	Voltage	Ohmage	Descriptive Information	Price	
R-929	24 VDC	425	1A Dbl. Brk.	1.25	<b>Wire and Cable</b>					R-889	28 VDC	7	360° Rotation in 12 steps with 7" lg. shaft	\$2.45	
R-982	12 VDC	24	1A Dbl. Brk.	1.55	<b>Volume Controls</b>					R-766	25 VDC	4/230	360° Rotation in 12 steps with 2 1/2" lg. shaft and 8-6 Terminal Wafers mounted on 12" x 5" Terminal Board with 63 Screw Terminals plus lugs	4.00	
R-947	12/24 VDC	320	1C @ 3 amps.	1.25	<b>Co-Ax</b>					<b>Relays</b>					
R-980	24 VDC	95	1A Dbl. Brk. @ 20 amps.	1.55	<b>Connectors</b>					<b>Relays</b>					
R-926	24 VDC	95	4C @ 15 amps.	3.55	<b>Antennas</b>					<b>Relays</b>					
R-983	24 VDC	265	3A	1.65	<b>Rectifiers</b>					<b>Relays</b>					
R-984	24 VDC	375	1C	1.65	<b>Transformers</b>					<b>Relays</b>					
R-878	24 VDC	375	1C Micalex	1.65	<b>Chokes</b>					<b>Relays</b>					
R-871	18.24 VDC	2000	2C	1.65	<b>Assemblies</b>					<b>Relays</b>					
R-936	28 VDC	1000	1C @ 1.5 amps.	1.65	<b>Dial Light Assemblies</b>					<b>Relays</b>					
R-829	12/18 VDC	270	1A	1.45	<b>Toggle</b>					<b>Relays</b>					
R-905	32 VDC	1500	1C Dbl. Brk. @ 15 amps.	3.25	<b>Relays</b>					<b>Relays</b>					
R-869	115 VDC	600	1A Dbl. Brk.	2.25	<b>Relays</b>					<b>Relays</b>					
R-963	220 VAC	1.75	2C-1A Dbl. Brk.	7.50	<b>Relays</b>					<b>Relays</b>					
R-928	35C MA	1.75	1C @ 6 amps.	1.25	<b>Relays</b>					<b>Relays</b>					
R-933	12 VDC	65	1A @ 100 amps.	4.95	<b>Relays</b>					<b>Relays</b>					
R-955	12 VDC	65	1B @ 100 amps.	4.95	<b>Relays</b>					<b>Relays</b>					
R-934	24 VDC	160	1A @ 100 amps.	4.95	<b>Relays</b>					<b>Relays</b>					
R-876	12 VDC	175	2A 1B	1.60	<b>Relays</b>					<b>Relays</b>					
R-882	24 VDC	300	1A	3.30	<b>Relays</b>					<b>Relays</b>					
R-860	48 VDC	3000	2A @ 1 amp. 230 v	2.60	<b>Relays</b>					<b>Relays</b>					
R-821	24 VDC	1050	2C	2.75	<b>Relays</b>					<b>Relays</b>					
R-958	60 VDC	1550	2A @ 12 amps.	1.50	<b>Relays</b>					<b>Relays</b>					

### ROTARY RELAYS Type 76-77 14 VDC—2 Ohm Energizing, 125 Ohms Holding Coil 30° Rotation 1/2" Long Shaft.

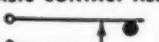
Stock No.	First Wafer				Second Wafer				Price
	Circuit 1	Circuit 2	Circuit 3	Term	Circuit 1	Circuit 2	Circuit 3	Term	
R-877	1 NC	1 NC	...	4	1 NO	1 NO	1 NO	9	\$2.25
R-892	3 NO	...	...	4	SPDT	SPDT	...	8	2.40
28 VDC—7 Ohms Energizing, 230 Ohms Holding Coil 30° Rotation 1/4" Lg. Shaft									
R-711	SPDT	2 pole reversing	...	8	With Coupling	...	...	...	2.05
R-712	1 NC	1 NC	1 NC	6	...	...	...	...	2.05
R-573	2 pole reversing	...	...	5	...	...	...	...	2.05
R-901	2 NO-1 NC	...	...	4	SPDT	SPDT	3 NC	10	2.25
R-616	1 NC	1 NC	...	4	1 NC	1 NC	1 NO	8	2.40

\* NOTE: Number of terminals excludes those required for operation of relay.

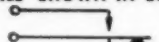
### BASIC CONTACT ASSEMBLIES SHOWN IN UNOPERATED NORMAL POSITION



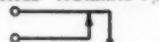
Form A—"Make"  
(Single Throw,  
Normally Open)



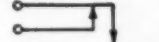
Form B—"Break"  
(Single Throw,  
Normally Closed)



Form C—"Break-Make"  
(Double-Throw)



Form D—"Make-  
Before-Break"



Form E—"Break-  
Make-Before-Break"

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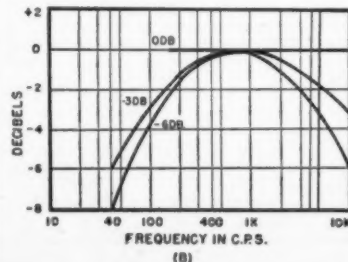
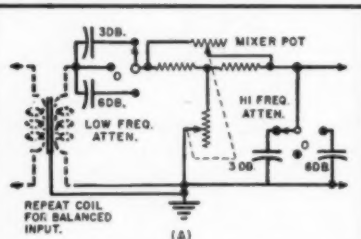
The music microphone is set for a flat response.

The voice filter in a ribbon velocity microphone consists of a reactor paralleled across the output winding of the microphone impedance matching transformer. This results in the low frequencies being slowly tapered off, beginning at 300 cycles, 100 cycles being down 5 db and 40 cycles, 15 db.

At times it may be necessary to reverberate music or dialogue. This may be accomplished several different ways; however, the accepted method is the use of an echo chamber as described in Part 4 of this series. The signal from the echo chamber is taken from the output of the preamplifier of the microphone to be reverberated. The signal is then fed to a power amplifier which, in turn, drives the speaker in the echo chamber. The reverberated sound from the chamber is fed to a preamplifier, an equalizer, a second preamplifier, and then to one of the mixer pots for controlling the amount of reverberation. The equalizer should be capable of increasing or decreasing either end of the frequency spectrum. Each type of program material reverberated will require a different type of equalization to secure the desired results.

Referring to the block diagram again, we now come to the mixer, employing 10 input positions and a master gain control. Each input is provided with high and low frequency attenuators. In the low frequency position two amounts of attenuation are available, 3 and 6 db at 100 cycles. The high frequency attenuation reduces 10,000 cycles 3 and 6 db. If greater amounts of attenuation are required, the losses may be increased to 6 and 12 db in other positions and patched in as re-

Fig. 6. (A) Low frequency attenuation is achieved by connecting capacity in series with input circuit and high frequency reduction by paralleling capacity across circuit. (B) High frequency reduction obtained at 10,000 cps by paralleling the input with capacity. 3 db with a .1  $\mu$ f. condenser and 6 db reduction with .2  $\mu$ f.



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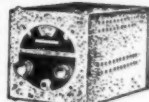
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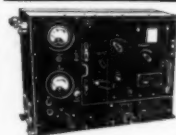
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quired. Low frequency attenuation is achieved by connecting capacity in series with the input circuit and high frequency reduction by paralleling capacity across the circuit. The method used is illustrated in Fig. 6A. The design of such attenuators will be discussed in a future article in this series. If the input circuit of the mixer is 600 ohms, 6 db of attenuation at 100 cycles may be secured by the use of a .5  $\mu$ fd. condenser in series with the input. For 3 db reduction, a 1  $\mu$ fd. condenser is used. Three db of high frequency reduction at 10,000 cycles may be obtained by paralleling the input with a .1  $\mu$ fd. condenser and 6 db reduction with .2  $\mu$ fd. The frequency response for these values is shown in Fig. 6B.

It will be assumed for illustration that the mixer is an unbalanced parallel resistive network, using bridged "T" mixer pots. Mixer networks have two losses; one fixed by the network configuration and called the "insertion loss," and a second, a variable one, created by the setting of the mixer pot. For this example we will assume that the mixer pot is set to a position of 15 db loss and that the fixed insertion loss of the network is 20 db, which is approximately correct for a mixer of this design.

The input circuits of the mixer may be unbalanced as shown in Fig. 6A or repeat coils may be permanently connected at the inputs so that either balanced or unbalanced circuits may be connected, thus increasing flexibility. An output transformer should be included in the network to isolate the ground of the mixer from other devices, thus reducing the possibility of ground loops and allowing it to be used either with balanced or unbalanced circuits.

If it is assumed that a signal level of minus 10 dbm is applied to input 1, with the mixer pot set to 15 db loss (plus the 20 db insertion loss of the network), the level at the output of the mixer will be a minus 45 dbm. This level is fed to a booster amplifier with a gain of 30 db which raises the output level of the mixer to a minus 15 dbm which is applied to the input of a master gain control. The master gain control carries an average loss of 20 db and again reduces the signal level to a minus 35 dbm. A master gain control is necessary for over-all fades at the mixer console and it also provides an over-all control of the system gain.

This now brings us to the high and low-pass filters, each having an insertion loss in their passbands of .5 db. These filters will find their greatest use with film recording equipment, however, they will be quite useful at times for other types of recording. For recording a medium frequency range, the high frequency end should be limited by the use of one of the lower cut-off frequencies afforded by the low-pass filter. The 40 cycle high-pass filter may be left in the circuit at all times unless a higher frequency cut-off is required. This filter is useful in eliminating low frequency rumble and

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PCO-150 PSO-150	P-P 6V6's, 6F6's P-P 6K6's	AB AB <sub>1</sub>	Pri: 10,000 ohms CT Sec: 600/150/ * 16/8/4 ohms	200 ma.	15 watts	10.45 14.85
PCO-200 PSO-200	P-P 6L6's P-P Parallel 6V6's	B AB <sub>2</sub> †	Pri: 6,000 ohms CT Sec: 600/150/ * 16/8/4 ohms	250 ma.	30 watts	13.75 18.15

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PCD-25 PSD-25	P-P 6N7's, 6A6's, 6J5's, 6C4's, etc.	20,000 ohms CT	25 ma.	3:1	5.20 7.70
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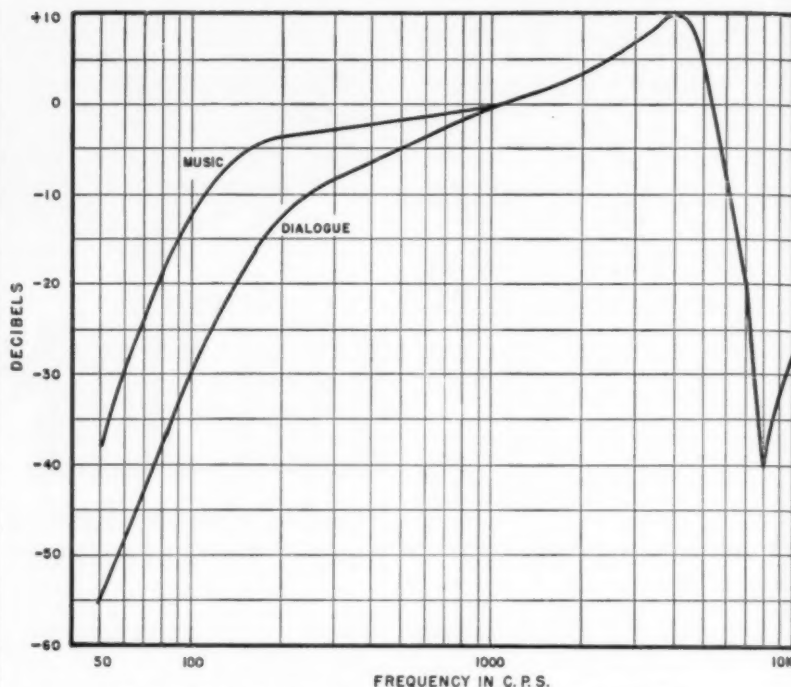


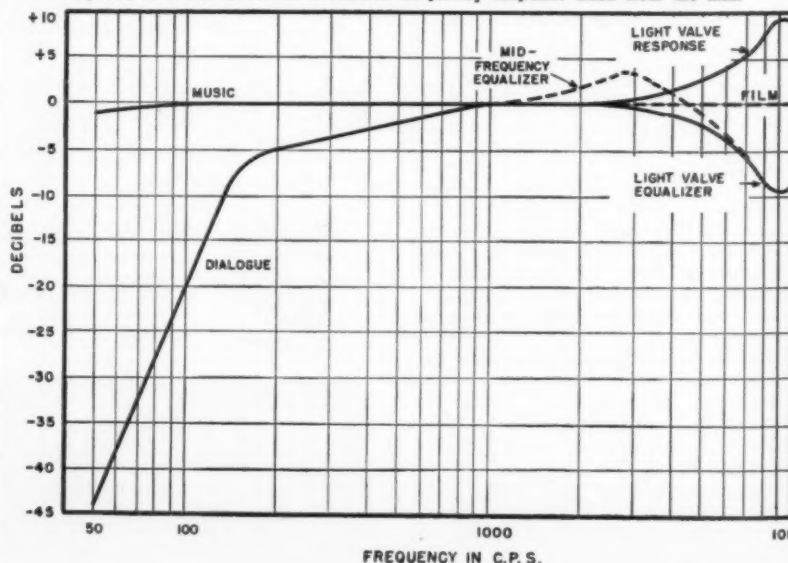
Fig. 7. Electrical frequency characteristics for 16 mm film recording.

building vibrations. For dialogue recording, an 80 cycle high-pass filter is substituted for the 40 cycle and at times a 120 cycle may be required. These filters may be designed with a switching arrangement for selecting the different cut-off frequencies, thus reducing the need for several units.

For dialogue recording on 35 mm film, it is the practice to use the high and low-pass filters with a "dialogue equalizer," which resonates in the mid-frequency range. The purpose of the equalizer is to introduce a certain amount of accentuation in the mid-

frequencies to add "presence" to the dialogue. The amount of equalization will vary depending on the character of the voice and the type of microphone used. Mid-frequency equalization is particularly important when recording on 16 mm film because of the sharp high frequency cut-off employed. The electrical frequency characteristics for 16 mm film recording is illustrated in Fig. 7. It will be noted the high frequencies cut off at approximately 5000 cycles, and that the mid-frequency equalization has a rise of 7.5 db at 4500 cycles. Because of this

Fig. 8. For variable density recording, using a light valve, an equalizer having an inverse frequency characteristic of the light valve above 3000 cycles will be required in order to secure a uniform frequency response back from the film.



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2V3G	6T7G	12A6	12H6	77
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1A5GT		6J5GT	6R7GT	6W7G	

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cut-off at 5000 cycles, it is necessary to attenuate the low frequencies to secure the correct frequency balance. For music recording, the low frequency end is extended but the mid-frequency rise is still used. These frequency characteristics may be obtained by a combination of the dialogue equalizer, high and low-pass filters.

For 35 mm film recording, the mid-frequency equalizer resonates at 3000 cycles and is variable in steps of 1 db up to a maximum of 8 db. The amount of equalization required will be determined by the type of microphone, set conditions, and experience with the system. For either type recording, the equalizer is placed after the microphone preamplifier and ahead of the mixer.

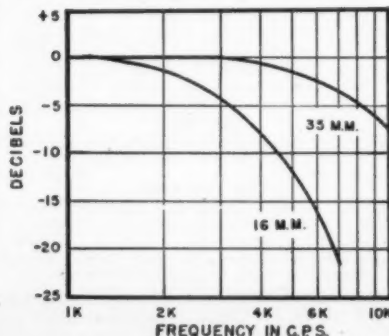
Equalization will also be required to compensate for the frequency characteristics of the light valve or recording galvanometer in the film recorder. For variable density recording, using a light valve, an equalizer having an inverse frequency characteristic of the light valve above 3000 cycles will be required to secure a uniform-frequency response back from the film. See Fig. 8. If the system records variable area, it may or may not require compensation at the higher frequencies. This information may be secured from the manufacturer of the equipment.

To illustrate how such equalization could be inserted in our block diagram, the equalizer is shown connected between the output of bridging amplifier Number 2, and the input to the film recorder. No operating levels have been indicated, as they will be dependent upon the type recorder used.

Fig. 9 is a graph of the frequency response for typical 16 mm and 35 mm film recording systems. This data may be obtained by recording a series of constant-amplitude frequencies then measuring their amplitudes on the recorded negative with a micro-densitometer.

Leaving the filters we come next to the line or recording amplifier. This amplifier must have a low noise level, low distortion, and uniform frequency characteristics and be capable of producing an output level of at least plus 30 dbm (1 watt). For our illustration, this amplifier will require a gain of

Fig. 9. Frequency response for typical 16 mm and 35 mm film recording systems.

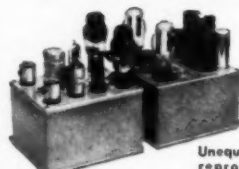


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Unequalled for quality reproduction of any sound source, the McIntosh is the most advanced amplifier of the day. Its unique, compact design offers: HIGHEST EFFICIENCY—over 65%; LESS THAN 1% DISTORTION AT PEAK POWER; DYNAMIC RANGE: OVER 70 db; FREQUENCY RESPONSE: 20-20,000 cps.

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McINTOSH Engineering Laboratories, Inc.  
320 Water Street, Binghamton, N. Y.



Beautiful  
TV CABINETS  
For Custom-Built  
Sets or Conversions

Here are the cabinets whose precision workmanship and true furniture beauty have made them the unquestioned leaders in the industry!

Series 503 TV Cabinets accommodate all 630, Radio Craftsmen and similar chassis, all sizes round and rectangular tubes. Complete with all mountings for tube and yoke. Choicest select-grain woods and finest hardware. Fidelity-styled in Period, Traditional and Modern, and hand-rubbed to custom high lustre in Mahogany, Walnut, Ebony or Blond. 40" h, 24" w, 24" d.

Series 505 TV Combination Console Cabinets have identical features plus separate compartments for all FM-AM radio chassis, record changers and record storage. 40" h, 40" w, 24" d.

Write NOW for literature and prices.

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RAvenswood 9-6010

RADIO & TELEVISION NEWS



40 db. Following the line amplifier is a "limiter-compressor" amplifier. The type of recording to be made will determine whether this amplifier is to be set for limiting or compression. Compressors will be discussed in Part 7.

(To be continued)

### Sweep-Marker Signals

(Continued from page 49)

scope. Typical response patterns marked by this method are pictured in Figs. 4C and 4D. This method of providing marks seems to have fewer disadvantages than any of the others, and has met with wide acceptance since its introduction several months ago.

1. Marks are stable, bright, and easy to look at for long periods of time.

2. Mark level is continuously adjustable and may be set at any convenient value for ease in viewing.

3. The mark is entirely independent of the set under test and is visible regardless of the state of adjustment or maladjustment.

The "Marka-Sweeps" and "Rada-Sweep" mentioned earlier are among the newest of the combination sweep and marker generators. These instruments employ the permeability variation method of obtaining sweep signal, and include crystal positioned marks of the independent pulse type. A combination block-schematic diagram of the "Marka-Sweep" I.F. model for television receiver alignment is shown in Fig. 5. This is an example of the newest circuit techniques employed in this still-growing field. —30—

### RADIO CONTROL CONTEST

FROM Ted Houk, president of the Model Yacht Racing Association of America, comes word of an event of interest to those who build and sail radio controlled model boats.

On Monday, September 3rd (Labor Day), the Oregon Model Yacht Club will sponsor the competition for the Walker Remote Control Trophy at the Westmoreland Pool in Portland, Oregon. The trophy is valued at \$500.

Persons desiring complete details on this contest are asked to write to R. B. Strange, secretary of the sponsoring group, at 7722 S. E. 16th, Portland, Oregon.

Skippers entering this event must be members of some club affiliated with the M.Y.R.A.A. For the name and address of the club nearest you, write to Leroy Gesbeck whose address is given below. He will also register the yacht as a DX-Class boat. The national registration fee is \$1.00.

Mr. Houk points out that persons planning to enter models in this race should secure a copy of the regulations covering this competition from Leroy Gesbeck, national treasurer, at 7345 S. Blackstone, Chicago 19. The set of three rule books (Rating Rules, The Constitution and Regulations, and General Rules and Pond Sailing Rules) is \$1.15. Recent additions and changes make it imperative to secure a copy of the latest rules. —30—

August, 1951

*Now you can get*



## QUICK test setting data on new tubes

Two weeks after a manufacturer has made the characteristics of a new tube available, we supply a test setting bulletin to distributors. The above photograph shows the "Bullet-in" board that is furnished free and upon which each bulletin is posted as soon as a distributor receives it.

Users of Jackson Testers can obtain the information from distributors immediately instead of waiting until a new roll chart is issued.

Recognizing the value of this service, alert distributors post each new bulletin promptly so that their customers can get the benefit at the earliest possible moment.

For the convenience of Jackson Tester users who are no longer entitled to free roll charts, the bulletins advise when new charts are ready.

Look for the bulletin when you visit your distributor's store. If you see it, copy the test setting data. If you can't locate the bulletin, tell the distributor you want to see it.

**JACKSON ELECTRICAL INSTRUMENT CO.**

"Service Engineered"  
Test Equipment

DAYTON 2, OHIO

In Canada:  
The Canadian Marconi Co

# NOW!

another great VEE-D-X  
*Single Channel*  
sensation

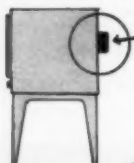
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ONLY  
**\$19.95**  
LIST



it's the

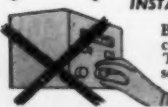
## VEE-D-X *Outboard* BOOSTER

Here is the greatest development to improved single channel TV reception since the VEE-D-X "J" Series Yagi. Pre-set for any desired channel, the VEE-D-X Outboard costs much less than any tuned booster, yet delivers 18 db gain with full 5 megacycle band width. Individual slug tuned grid and plate coils assure perfect alignment — 6J6 push-pull cross-neutralized amplifier will not oscillate — unique RF assembly is compact and precision engineered — plus many more outstanding features that revolutionize single channel reception. For complete information contact your local supply source or write direct to The LaPointe-Plascomold Corporation, Windsor Locks, Connecticut.



**OUT OF SIGHT!  
OUT OF THE WAY!**

Fits snugly against back panel of any TV set. No wires, no knobs exposed to TV viewers.



**INSTALL IT!—FORGET IT!**

Bothersome tuning completely eliminated. Turns on and off with set automatically.

## What's New in Radio

For additional information on any of the items described herein, readers are asked to write direct to the manufacturer. By mentioning RADIO & TELEVISION NEWS, the page, and the issue number, delay will be avoided.

### HICKOK V-O-M

The Hickok Electrical Instrument Company, 10677 Dupont Avenue, Cleveland 8, Ohio has introduced a new battery-operated v-o-m, the Model 450, especially designed for field work of all kinds.

The large 5" lucite meter case provides good readability while the guar-



anteed unbreakable, shock resistant case protects the high sensitivity of this instrument. Sensitivity is 20,000 ohms per volt d.c. and 5000 ohms per volt a.c. Voltage ranges, both a.c. and d.c., are 2.5, 10, 50, 250, 1000, and 5000; d.c. milliamperes are measured in ranges of 2.5, 10, 50, 250, and 1000; d.c. microampere ranges are 0 to 50; d.c. amperes are 0 to 10. Decibels can be measured from -30 to +55 in five ranges. There are four ohm ranges: 0 to 1000, 0 to 10,000, 0 to 1 megohm, and 0 to 100 megohm.

The unit measures 5 1/4" x 8 3/4" x 2 1/2" and weighs 2 3/4 pounds. Test leads are supplied with the instrument.

### SIGNAL GENERATOR

A new wide-range signal generator, the Model 706A, has just been intro-



duced by Radio City Products Co., Inc. of 152 W. 25th Street, New York 1, New York.

This new instrument is said to provide high stability and accuracy in con-

tinuous coverage of 150 kc. to 220 mc. This is accomplished in 8 ranges, 6 being fundamental frequencies covering through 55 mc.

Accuracy is maintained within 1 per-cent of calibration. Adjustment and recalibration is possible by means of air trimmers. Thorough shielding of all critical circuits is provided, as well as for the components either individually or in compartments or both. This includes the oscillator tube, coil assembly, attenuator, and switching circuit. The transformer is electrostatically shielded.

Complete information on the Model 706A is available from the company on request.

### B.C. LOOP ANTENNA

Grayburne Corporation, 20 South Broadway, Yonkers 2, New York is in production on a new broadcast radio loop antenna which combines high efficiency, high sensitivity, and omnidirectivity with low cost and small size.

Tradenamed the "Ferri-Loopstick," the new unit features a "Q" of 240-275



and provides increased sensitivity and signal-to-noise ratio of receivers. The heart of the new antenna is its ferrite core formed by a special process to provide extremely high permeability. The unit measures only 1/2" in diameter and 2" in length.

Distributors and loop, coil, and set manufacturers may obtain free samples of the "Ferri-Loopstick" for test purposes by writing on their company letterhead.

### NEW PILOT LIGHT

Industrial Devices, Inc., Edgewater, New Jersey is now manufacturing a new and improved low-cost pilot light known as the "Omni-Glow" Model 1010.

The new unit is a neon light encased in a nylon tube which slips through the mounting panel and is held in place with a special speed nut supplied with

**RADIO & TELEVISION NEWS**



# TUBES

FROM  
**Niagara Radio Supply**

AT **50%** TO **50%** OFF

RECEIVING			ALL NEW • BRANDED • GUARANTEED										2K25			287A			918												
00A	\$1.60	523	\$0.90	68B7Y	\$1.20	12BA7	\$1.19	37	\$0.84	2K28	\$39.50	287A	\$2.75	918	\$1.50	00A	\$1.60	523	\$0.90	68B7Y	\$1.20	12BA7	\$1.19	37	\$0.84	2K28	\$39.50	287A	\$2.75	918	\$1.50
0A2	1.60	524	1.33	68C7	1.00	12BD6	1.00	38	1.00	2K29	35.00	290A	4.95	923	.99	0A2	1.60	524	1.33	68C7	1.00	12BD6	1.00	38	1.00	2K29	35.00	290A	4.95	923	.99
0A3 VR75	1.33	525	1.60	68D7GT	1.45	12BE6	1.00	39	39.44	2K30	22.50	291A	4.95	924	1.25	0A3 VR75	1.33	525	1.60	68D7GT	1.45	12BE6	1.00	39	39.44	2K30	22.50	291A	4.95	924	1.25
0A4GT	1.60	526	1.33	68E7GT	1.00	12BF6	1.00	40	1.10	2K31	12.50	292A	4.95	925	.33	0A4GT	1.60	526	1.33	68E7GT	1.00	12BF6	1.00	40	1.10	2K31	12.50	292A	4.95	925	.33
0B2	1.78	527	1.95	68F7	1.00	12BG6	1.00	41	1.00	2K32	2.75	301A	4.95	955	.40	0B2	1.78	527	1.95	68F7	1.00	12BG6	1.00	41	1.00	2K32	2.75	301A	4.95	955	.40
0B3 VR90	1.33	528	1.09	68G7	1.00	12BH6	1.00	42	.78	2K33	4.75	301H	19.50	956	.40	0B3 VR90	1.33	528	1.09	68G7	1.00	12BH6	1.00	42	.78	2K33	4.75	301H	19.50	956	.40
0Y1	2.40	529	1.10	68H7GT	.75	12BI6	.75	43	.78	2K34	4.75	301L	19.50	957	.40	0Y1	2.40	529	1.10	68H7GT	.75	12BI6	.75	43	.78	2K34	4.75	301L	19.50	957	.40
0Y4G	.75	530	1.00	68I7GT	.75	12BJ6	.75	44	.48	2K35	3.75	307A	5.80	958A	12.50	0Y4G	.75	530	1.00	68I7GT	.75	12BJ6	.75	44	.48	2K35	3.75	307A	5.80	958A	12.50
IA3	.75	531	1.33	68J7	1.00	12BK6	1.00	45	.75	2K36	3.75	310A	7.90	967A	4.95	IA3	.75	531	1.33	68J7	1.00	12BK6	1.00	45	.75	2K36	3.75	310A	7.90	967A	4.95
IA4P	1.95	532	1.60	68K7 1B53	1.60	12BL6	1.00	46	1.45	2K37	3.12A	311A	8.50	968A	1.33	IA4P	1.95	532	1.60	68K7 1B53	1.60	12BL6	1.00	46	1.45	2K37	3.12A	311A	8.50	968A	1.33
IA6	1.60	533	1.45	68L7 1B52	1.45	12BM6	1.00	47	2.40	2K38	2.00	312A	8.50	969	1.33	IA6	1.60	533	1.45	68L7 1B52	1.45	12BM6	1.00	47	2.40	2K38	2.00	312A	8.50	969	1.33
IA7GT	1.10	534	1.60	68M7GT	1.60	12BN6	1.00	48	1.00	2K39	2.40	313A	8.50	970	1.33	IA7GT	1.10	534	1.60	68M7GT	1.60	12BN6	1.00	48	1.00	2K39	2.40	313A	8.50	970	1.33
IA85	1.60	535	.90	68N7GT	.90	12BP6	.90	49	1.45	2K40	3.25	315A	8.50	971	1.33	IA85	1.60	535	.90	68N7GT	.90	12BP6	.90	49	1.45	2K40	3.25	315A	8.50	971	1.33
IA85	1.60	536	.90	68O7GT	.90	12BQ6	.90	50	1.45	2K41	3.25	316A	8.50	972	1.33	IA85	1.60	536	.90	68O7GT	.90	12BQ6	.90	50	1.45	2K41	3.25	316A	8.50	972	1.33
IA85	1.60	537	.90	68P7GT	.90	12BR6	.90	51	1.45	2K42	3.25	317A	8.50	973	1.33	IA85	1.60	537	.90	68P7GT	.90	12BR6	.90	51	1.45	2K42	3.25	317A	8.50	973	1.33
IA85	1.60	538	.90	68Q7GT	.90	12BS6	.90	52	1.45	2K43	3.25	318A	8.50	974	1.33	IA85	1.60	538	.90	68Q7GT	.90	12BS6	.90	52	1.45	2K43	3.25	318A	8.50	974	1.33
IA85	1.60	539	.90	68R7GT	.90	12BT6	.90	53	1.45	2K44	3.25	319A	8.50	975	1.33	IA85	1.60	539	.90	68R7GT	.90	12BT6	.90	53	1.45	2K44	3.25	319A	8.50	975	1.33
IA85	1.60	540	.90	68S7GT	.90	12BU6	.90	54	1.45	2K45	3.25	320A	8.50	976	1.33	IA85	1.60	540	.90	68S7GT	.90	12BU6	.90	54	1.45	2K45	3.25	320A	8.50	976	1.33
IA85	1.60	541	.90	68T7GT	.90	12BV6	.90	55	1.45	2K46	3.25	321A	8.50	977	1.33	IA85	1.60	541	.90	68T7GT	.90	12BV6	.90	55	1.45	2K46	3.25	321A	8.50	977	1.33
IA85	1.60	542	.90	68U7GT	.90	12BW6	.90	56	1.45	2K47	3.25	322A	8.50	978	1.33	IA85	1.60	542	.90	68U7GT	.90	12BW6	.90	56	1.45	2K47	3.25	322A	8.50	978	1.33
IA85	1.60	543	.90	68V7GT	.90	12BX6	.90	57	1.45	2K48	3.25	323A	8.50	979	1.33	IA85	1.60	543	.90	68V7GT	.90	12BX6	.90	57	1.45	2K48	3.25	323A	8.50	979	1.33
IA85	1.60	544	.90	68W7GT	.90	12BY6	.90	58	1.45	2K49	3.25	324A	8.50	980	1.33	IA85	1.60	544	.90	68W7GT	.90	12BY6	.90	58	1.45	2K49	3.25	324A	8.50	980	1.33
IA85	1.60	545	.90	68X7GT	.90	12BZ6	.90	59	1.45	2K50	3.25	325A	8.50	981	1.33	IA85	1.60	545	.90	68X7GT	.90	12BZ6	.90	59	1.45	2K50	3.25	325A	8.50	981	1.33
IA85	1.60	546	.90	68Y7GT	.90	12C6	.90	60	1.45	2K51	3.25	326A	8.50	982	1.33	IA85	1.60	546	.90	68Y7GT	.90	12C6	.90	60	1.45	2K51	3.25	326A	8.50	982	1.33
IA85	1.60	547	.90	68Z7GT	.90	12D6	.90	61	1.45	2K52	3.25	327A	8.50	983	1.33	IA85	1.60	547	.90	68Z7GT	.90	12D6	.90	61	1.45	2K52	3.25	327A	8.50	983	1.33
IA85	1.60	548	.90	69A7GT	.90	12E6	.90	62	1.45	2K53	3.25	328A	8.50	984	1.33	IA85	1.60	548	.90	69A7GT	.90	12E6	.90	62	1.45	2K53	3.25	328A	8.50	984	1.33
IA85	1.60	549	.90	69B7GT	.90	12F6	.90	63	1.45	2K54	3.25	329A	8.50	985	1.33	IA85	1.60	549	.90	69B7GT	.90	12F6	.90	63	1.45	2K54	3.25	329A	8.50	985	1.33
IA85	1.60	550	.90	69C7GT	.90	12G6	.90	64	1.45	2K55	3.25	330A	8.50	986	1.33	IA85	1.60	550	.90	69C7GT	.90	12G6	.90	64	1.45	2K55	3.25	330A	8.50	986	1.33
IA85	1.60	551	.90	69D7GT	.90	12H6	.90	65	1.45	2K56	3.25	331A	8.50	987	1.33	IA85	1.60	551	.90	69D7GT	.90	12H6	.90	65	1.45	2K56	3.25	331A	8.50	987	1.33
IA85	1.60	552	.90	69E7GT	.90	12I6	.90	66	1.45	2K57	3.25	332A	8.50	988	1.33	IA85	1.60	552	.90	69E7GT	.90	12I6	.90	66	1.45	2K57	3.25	332A	8.50	988	1.33
IA85	1.60	553	.90	69F7GT	.90	12J6	.90	67	1.45	2K58	3.25	333A	8.50	989	1.33	IA85	1.60	553	.90	69F7GT	.90	12J6	.90	67	1.45	2K58	3.25	333A	8.50	989	1.33
IA85	1.60	554	.90	69G7GT	.90	12K6	.90	68	1.45	2K59	3.25	334A	8.50	990	1.33	IA85	1.60	554	.90	69G7GT	.90	12K6	.90	68	1.45	2K59	3.25	334A	8.50	990	1.33
IA85	1.60	555	.90	69H7GT	.90	12L6	.90	69	1.45	2K60	3.25	335A	8.50	991	1.33	IA85	1.60	555	.90	69H7GT	.90	12L6	.90	69	1.45	2K60	3.25	335A	8.50	991	1.33
IA85	1.60	556	.90	69I7GT	.90	12M6	.90	70	1.45	2K61	3.25	336A	8.50	992	1.33	IA85	1.60	556	.90	69I7GT	.90	12M6	.90	70	1.45	2K61	3.25	336A	8.50	992	1.33
IA85	1.60	557	.90	69J7GT	.90	12N6	.90	71	1.45	2K62	3.25	337A	8.50	993	1.33	IA85	1.60	557	.90	69J7GT	.90	12N6	.90	71	1.45	2K62	3.25	337A	8.50	993	1.33
IA85	1.60	558	.90	69K7GT	.90	12O6	.90	72	1.45	2K63	3.25	338A	8.50	994	1.33	IA85	1.60	558	.90	69K7GT	.90	12O6	.90	72	1.45	2K63	3.25	338A	8.50	994	1.33
IA85	1.60	559	.90	69L7GT	.90	12P6	.90	73	1.45	2K64	3.25	339A	8.50	995	1.33	IA85	1.60	559	.90	69L7GT	.90	12P6	.90	73	1.45	2K64	3.25	339A	8.50	995	1.33
IA85	1.60	560	.90	69M7GT	.90	12Q6	.90	74	1.45	2K65	3.25	340A	8.50	996	1.33	IA85	1.60	560	.90	69M7GT	.90	12Q6	.90	74	1.45	2K65	3.25	340A	8.50	996	1.33
IA85	1.60	561	.90	69N7GT	.90	12R6	.90	75	1.45	2K66	3.25	341A	8.50	997	1.33	IA85	1.60	561	.90	69N7GT	.90	12R6	.90	75	1.45	2K66	3.25	341A	8.50	997	1.33
IA85	1.60	562	.90	69O7GT	.90	12S6	.90	76	1.45	2K67	3.25	342A	8.50	998	1.33	IA85	1.60	562	.90	69O7GT	.90	12S6	.90	76	1.45	2K67	3.25	342A	8.50	998	1.33
IA85	1.60	563	.90	69P7GT	.90	12T6	.90	77	1.45	2K68	3.25	343A	8.50	999	1.33	IA85	1.60	563	.90	69P											



## SUPER-SENSITIVE RELAY

**WESTON SENSITROL**, coil sensitivity only 10 micro-ampere. Built 184 meter. At 1000, needle swings over into permanent magnet which grips it to close contacts rated 1 ampere. Perfectly damped; vibration will not close contacts. Built-in reset relay unlatches contacts when 12 to 24 volts AC or DC is momentarily applied to reset-leads. The Sensitrol works directly from photocells, thermocouples, or any source of minute current. No electronic amplifier needed! Now you can make a control device that consumes no power until it is triggered. Brand new. Here is a **\$12.95** \$69.50 device for only.

## THE HEART OF COLLINS' FAMOUS TCS TRANSMITTER

3-Gang condenser assembly with 4" precision dial etched 1.5-12 mc in 3 bands plus reference scale, with triangular plastic hairline indicator, 50:1 ratio drive assembly. Tuning lock. Two single-spaced 250 mmf and one double-spaced 260 mmf sections, all ceramic insulated. Overall 7" long x 4 1/2" x 4 1/2". New from bulk spares. With schematic TCS-12 xmr. **\$3.49**

## PORTABLE POWER

### Look at These Combination Kits!

1. 2 volt, 30 amp hour wet cell BB-54, light-weight transparent plastic, Non-spill, Fibrite separators. 3-bell hydrometer, 4 1/2" x 5 1/2" x 5 1/2" high overall. Shipped dry, with filling and charging instructions. **\$3.95**
2. 2 volt synchronous vibrator, No tube needed. **\$3.95**
3. 3 volt charger, 115 v, 50/60 cy in. High quality unit uses step-down transformer and 100-watt rectifier, with pilot lamp in output to indicate and regulate charging rate. With instructions. **\$3.95**
4. Dry-cell type battery. **\$3.95**

**ALL 4 ITEMS, ALL BRAND NEW, ONLY... \$3.95**

**3 BB-54 and new box CH-291 made for them. \$4.95**  
Set-up gives you 6 volts, for ONLY... **\$4.95**  
The boxes have interlock and snap-clasp are masterpieces of compact, light-weight craftsmanship. Use 4 set-ups for 12 v, 4 for 24 v.

**6 V. VIBRATOR**, Mailer 650, Resistor 5521, 4-prong, non-sync, 1 1/2" dia., 3/316" over cam, 115 cycle, 6 Amp, New **\$1.55**

## COMMAND EQUIPMENT

With free dope sheets and schematics.

**RECEIVERS**

BC-455, 6-9 mc. NEW \$12.95. GOOD USED... **\$7.95**

**COMMAND TRANSMITTERS**

BC-457, 4-5.3 mc. excellent used... **\$4.95**

BC-458, 5-5.7 mc. excellent used... **\$5.95**

T-23 ARC-9, Excellent used... **\$4.95**

Good used, less tubes... **7.95**

MB-7 ARC-9, Push-pull mod. excellent... **\$4.95**

MOD BC-456, Brand New \$5.95. Excellent used **2.49**

**274N PLUG**, 7-prong male plug to fit back of command receiver and smiler. This is the same plug used in the racks. NEW, each, 21¢; five for... **\$1.00**

**Local Control Adaptor parts for 274N or ARC-9** Exact put, switch, knobs, etched plate, and instruction data. Ready to mount... **\$1.29**

**Spine tuning knob**... **.79c**

**OIL FILLED 4x8 mfd. 600 v. condenser**, in one case, common ground with mfg. hooks, or used in a. w. w. w. Army Super-Pro power supply. NEW... **\$2.89**

## 4 USES—4 DOLLARS

The most versatile dynamometer in surplus! The best dynamometer for conversion to 6v. Multiple windings! After conversion you get choice of 100 or 350 v at 50 mA or 250 v at 100 mA. Or use it as a 211 or 122 step-up or step-down transformer for DC voltage. Changes 0 to 12, or 12 to 24, or vice versa, up to 3 A. Or use it as a GENERATOR. Turn with motor, get 12 v DC at 12.0 A or 24 v DC at 6.0 A, plus high voltage. Includes easily removable self-contained 800:1 sealed-in-volt gear reduction unit. Complete dope sheet furnished. **BRAND NEW... \$4.00**

**FREQ. METER BC-438**, Easily converted to precision lab. xtal calibrated heterodyne-type freq. meter and sig. gen., 20 to 440 mc., with audio modulation. We furnish simple instructions for conversion and calibration. Has power supply, tubes, and lab. standard xtal. Start where you like—221 or 121 ends. Excellent cond., complete as described. **\$27.50**

**METALLIC MINE DETECTOR SCR 625** with BA-38 battery. For non-ferrous or ferrous metals. Also operates under water. Brand new, export packed. **\$59.50**

## 10 METER DEFENSE NET

BC-650 Mobile xmr-receiv 27 to 38.9 mc. FM, 10 meter and new defense net. 2 chan xtal control with PE-117 or PE-97 6 v power supply. Good used. **\$39.50**

## GUARANTEED THE HOTTEST

## 10-METER RECEIVER!

Money back if you disagree! Easily adapted for mobile or AC. Instructions and schematic furnished. Also contains a built-in xtal-calibrated freq. meter similar to BC-221 Receivers A3 and FM. 27-38.9 mc. Double-conversion superhet. Self-contained speaker. **Only \$39.50**

**A-27 PHANTOM ANTENNA**, Use on 100 or 80 meters or for marine freq. 2 to 4.3 MC. Contains: 1 Var. Capacitor, xmtg. type, 18-157 mmfd., 2-fixed Vitrohm plaque wire-wound, non-inductive resistors, 12 ohms (5%) 40 w. In neat metal case with calibration chart and instruction manual. **\$1.59**

**RF AND AF SIGNAL TRACER BZ-5**, Tiny dual vibrator gives beautiful 1400 CPS tone with harmonics to 40 mc. NEW, with schematic and instr., **.79c**

**R-5A/APN-4**, 160-meter Loran receiver plus high (for scope) and low voltage power supply. Three chans, tunable 1.6-3.3 mc. 1 chan, tunable 3.3-11.75 mc. With schematic and instructions for 50 cy. **\$4.50**

**Excellent used, less tubes... \$4.50**

## WANTED!

Your Spare Surplus Equipment and Tubes, Dynamometers, Recvrs., Xmts., Test Equipment. Send List, stating condition and rock bottom price.

## G.L. ELECTRONICS

905 S. Vermont Ave., Los Angeles 6, Calif.

All Prices F.O.B. Los Angeles

Calif. Buyers Add Sales Tax.

## SCHEMATICS—CONVERSIONS FOR SURPLUS GEAR

### NEW LIST! MANY ADDITIONS!

Send stamped, self addressed envelope for List A. Add 25¢ for chart explaining AM nomenclature.

R. E. BOX 1220

GOODHEART BEVERLY HILLS, CAL.

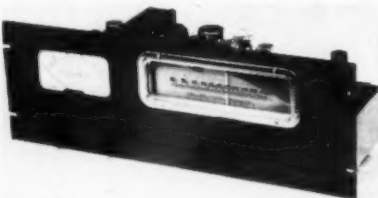
the unit. The lens is available in a wide selection of colors suitable to neon and features Fresnel lens for more even distribution of light. A polished metal collar connecting the lens and body provides an attractive trim on the operating side of the panel.

Operating on a voltage range of from 75 to 250 volts a.c. or d.c., the neon light withstands vibration and shock as well as voltage overloads that would ruin the usual incandescent pilot light. The new model is listed by Underwriters' Laboratories.

## PROFESSIONAL FM TUNER

**Collins Audio Products Co., Inc.**, P. O. Box 368, Westfield, New Jersey, has developed a professional-type FM tuner for precision work and special applications requiring quality performance.

The HP-14 uses 14 tubes and precise tuning is accomplished by means of a



4 1/2" square meter. Permeability tuning is used in the FM front end. The output circuit may be operated directly into any load from 500 ohms to 500,000 ohms. The output level is approximately 3 volts, depending into what load the tuner operates.

The tuner has an automatic squelch which is available at the flick of a switch. The unit measures 19" wide, 8" deep, and 7" high and comes with a gray crinkle finish panel and a chromium plated dial escutcheon. A mahogany cabinet is available at extra cost.

## CUSTOM RECTIFIERS

**Barry Electronics Corp.**, 136 Liberty Street, New York 6, New York, has announced the availability of a line of custom-built selenium rectifiers which sell in the competitive price range.

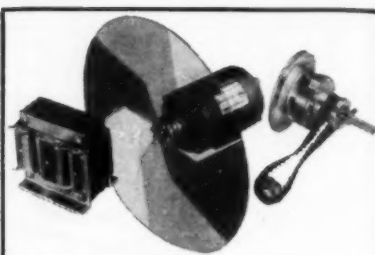
Rectifiers from 1 to 24 amperes are carried as regular stock items for immediate shipment. Special or non-stock items can usually be shipped within 48 hours.

Inquiries on this custom line should be accompanied by complete details including the type of rectifier used, service for which the unit is intended, voltage, and intermittent or constant drain.

## CRYSTAL DIODE

**Berkshire Laboratories**, 504 Lexington Road, Concord, Massachusetts, is making available to laboratories and electronic users its precision, high back resistance germanium crystal diode, the GCD-1.

Specifications on the diode include a continuous reverse working voltage of 80 volts maximum; peak back voltage for zero dynamic resistance of 90 volts



## COLOR CONVERTER KITS

Convert TV set to receive CBS Color



Write today for complete data

## COLOR SALES CO.

295 West Shore Dr. Massapequa, N.Y.

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trains you for vital industry —qualifies you for better jobs in the armed services.



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City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

Age \_\_\_\_\_

☐ Send details about Home Study Courses.

The ambient temperature range is from  $-50$  to  $+75$  degrees C and the average life is more than 10,000 hours. The diode will operate satisfactorily from d.c. to above 100 mc.

**NEW V.T.V.M.**

**Heath Company, Benton Harbor, Michigan**, is currently merchandising a new vacuum tube voltmeter kit, the Model V5.

A vintage portable electronic instrument, possibly a vacuum tube voltmeter or amplifier, with a carrying handle on top and a control panel featuring a large scale and several knobs.

meter scale for easy reading, six a.c. and d.c. ranges, and six resistance ranges covering from .1 ohm to over 1 billion ohms.

The kit comes complete with all parts including tubes, meter, transformer, test leads, and the cabinet. The accompanying construction manual includes step-by-step assembly instructions, pictorial diagrams, a schematic, and circuit description.

The company will supply full details on the Model V5 on request.

### CORNER SPEAKER SYSTEM

The Altec Lansing Corporation, 9356 Santa Monica Blvd., Beverly Hills, California has released a new corner speaker system designed especially for home installation.

The new 820A is a full two-way speaker system built into a mahogany corner type cabinet. It is a counterpart of the company's theater speaker system which is currently in use in more than 7000 theaters in the United States.

The components of this system consist of a newly-designed direct radiating horn cabinet, an 808 multicellular horn, two 803 low frequency units, and an N 800-D 600 cycle crossover network.

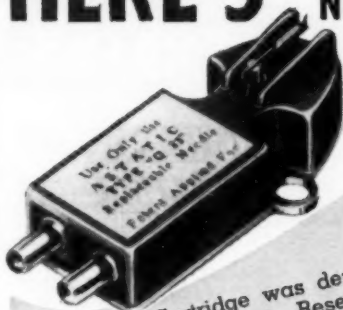
## ELECTRICAL STEEL

A new, thin electrical steel with unusual properties has been developed by Armco Steel Corporation of Middletown, Ohio.

Known as "Tran-Cor T-O-S," it can be operated at very high inductions, 20 per-cent higher than any nickel-iron alloy. The new material, thinner than most electrical steels, is intended for use in wound-type transformers and

## August, 1951


**HERE'S** EXACTLY WHERE ASTATIC'S  
NEW "CAC" CARTRIDGES  
CAN BE INSTALLED



**A**STATIC'S CAC-J Crystal Cartridge was developed in conjunction with the Engineering Research and Development Department of CBS to match the recording characteristics of LP records. It is internally equalized to follow Columbia Records, Inc., ideal frequency response for the recording characteristics of LP records. Other models in the "CAC" Series were developed on the same engineering principles, and have proved capable of the same new, high level of performance.

## ASTATIC "CAC" MODELS AND THE CARTRIDGES THEY REPLACE

CAC-J REPLACES*	CAC-AG-J REPLACES	CAC-78-J REPLACES
RCA 74067 74625 75476	ELECTRO-VOICE 33 33S	ELECTRO-VOICE 32 32S
ELECTRO-VOICE I4 14S 34 34S	SHURE P71 P71A P71B P71C P71CA P81 P81A	SHURE P70 P70A P85
SHURE P73 P73A P73AR P73R	P93MG P95MG W21A W21AR W53MG	W23A W23B
WEBSTER A2 A2M F12 F13M	WEBSTER A91 A9MI	WEBSTER A3 A3M



\*FITS ALL RCA 45 RE-  
CHANGERS AND IS STANDARD  
FOR COLUMBIA 102 AND

**SPECIAL MODELS FOR PLUG-IN HEADS.** Models CAC-W-J (1-mil needle) and CAC-78W-J (3-mil needle) are furnished with special terminals and fittings for quick, easy installation in record changer tone arms with plug-in heads.

\*FITS ALL RCA 45 RPM  
CHANGERS AND IS STANDARD  
FOR COLUMBIA 102 AND 103  
PLAYERS.

**LIST PRICE—All Models**  
**Sapphire Stylus . \$ 7.50**  
**Diamond Stylus . 31.00**

**THE *Astatic* CORPORATION**  
CONNEAUT, OHIO  
IN CANADA: CANADIAN ASTATIC LTD., TORONTO, ONTARIO

Astatic Crystal Devices manufactured under Brush Development Co. patents.

# Superior's *new* TELEVISION BAR GENERATOR



**AT YOUR  
RADIO PARTS  
JOBBER**

**DEALERS  
NET PRICE**

only  
**39<sup>95</sup>**

**THROWS AN  
ACTUAL BAR  
PATTERN  
ON ANY TV  
RECEIVER  
SCREEN!!**

## **TWO SIMPLE STEPS**

1. Connect Bar Generator to Antenna Post of Any TV Receiver.
2. Plug Line Cord into A.C. Outlet and Throw Switch.

**RESULTS**—A stable never-shifting vertical or horizontal pattern projected on the screen of the TV receiver under test.



Manufactured and Guaranteed by  
**SUPERIOR INSTRUMENTS CO.**  
227 Fulton Street • New York 7, N. Y.



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CALIBRATION AND TESTING ENGINEERS FOR PRODUCTION**

Job openings range from recent graduates to Engineers with years of experience. Attractive employee benefits include group insurance and pension plans; paid holidays and vacations.

Send complete resume, listing salary requirements and availability, to:

**Technical Employment Supervisor, Station 483-H**

**THE EMERSON ELECTRIC MFG. CO.**

8100 Florissant • St. Louis 21, Missouri

**LEADERS IN THE ELECTRICAL INDUSTRY SINCE 1890**

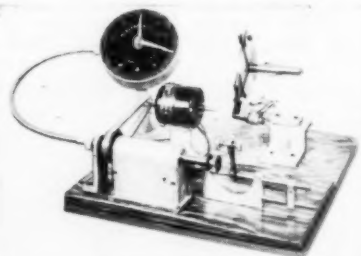
reactors which operate at 400 cycles.

The new material is supplied in only 4 mil thicknesses and in 12½" wide coils. It is surface treated on both sides by a special chemical and thermal processing to insure low interlaminar energy losses. The surface treatment is unaffected by annealing.

Full details on this new electrical steel are available from the company.

## **MINIATURE COIL WINDER**

A new miniature coil winder for winding tiny, fine wire, random wound bobbin coils up to ¾" in width and 1½"



in diameter has been developed by Geo. Stevens Mfg. Co., Inc. of 6022 N. Rogers, Chicago 30, Illinois.

The Model 39 weighs only 26 pounds and measures 24" long, 12" wide, and 8" high. Permanent alignment is assured as the machine comes mounted on a steel plate. Winding speeds up to 5000 rpm are obtainable by means of a 1½ hp. variable speed, series wound, a.c.-d.c. motor and foot operated speed control for 115 volt operation. A step-down transformer is available for 230 volt operation. —50—

## **BALLOON TRANSMISSION**

**H**AMS Associated of Albuquerque, New Mexico will launch a free flight balloon carrying a v.h.f. transmitter which will automatically transmit a m.c.w. signal on 143.9 mc.

In cooperation with Air Force MARS the Albuquerque group is sponsoring this experiment on August 11th to arouse interest in v.h.f. activity, to obtain meteorological data, and to focus attention on the Air Force MARS program.

The transmitter (one or two watts' output) will be keyed at a slow speed to transmit the callsign of the HA-2, AF5QPK, followed by a four-letter code group for authentication. Battery life is expected to permit operation from 18 to 24 hours. Balloon height will be stabilized at 50,000 feet at which elevation it is expected to drift across the United States in a northeasterly direction. This should bring the balloon within range of many of the larger cities with their v.h.f. equipped stations and receivers.

Special QSL cards will be sent to all persons reporting the reception of signals from the HA-2. All persons hearing the balloon's signals are urged to report the time, location of receiver, signal strength, code symbol received, and any other data to Hams Associated, Tijeras, New Mexico.

The balloon will be launched between 7 and 8 p.m. (Mountain Standard Time) on Saturday, August 11th. —50—

**RADIO & TELEVISION NEWS**



# PARTS and TUBES

**ORDER**  
from  
**"PREMIER"**  
Your reliable source  
since 1926

## FREE!

\$20.00 List Value  
Cornell-Dubilier,  
Mallory, Aerovox,  
Sprague, Filter  
Condensers  
Ten good filters  
FREE with each  
100 tubes.

## TUBE KITS

3Q4, 1T4, 1R5, 1S5. List Value \$8.00. Tube Kit only	\$2.39
354, 1T4, 1S5, 1R5. List Value \$7.80. 4 Tube Kit	\$2.39
1U4, 354, 1S5, 1R5. List Value \$7.80. All Four Tubes for	\$2.39
3V4, 1R5, 1S5, 1T4. List Value \$7.80. All for	\$2.39
117Z3, 1U5, 3V4, 1R5, 1T4. AC-DC Portable Kit. All for	\$2.89
12AT6, 12BA6, 12BE6, 35W4, 50B5. 5 Tubes for	\$2.95
50L6, 35Z5, 12SQ7, 12SK7, 12SA7. 5 Tubes for	\$3.22

## TV CONVERSION KITS

Convert 10" and 12" sets to 14"—includes 14BP4  
Tube 70 Degree Deflection Yoke  
and Attractive Lucite Mask to  
eliminate all finish work on  
cabinet. Complete

**\$29<sup>95</sup>**

## 17" CONVERSION KIT

Consisting of rectangular  
tube, 70 Degree Yoke, Beauti-  
ful Mask and Flyback Trans-  
former. Complete

**\$37<sup>95</sup>**

## RESISTORS

Insulated  $\frac{1}{2}$  and 1 Watt assort-  
ment of most used values, best  
brands. 50 for \$2.25; 100 for

**\$3<sup>95</sup>**

## BY-PASS CONDENSERS

Tubular condensers. Nationally  
advertised brands. High Quality.  
Overstock sale price:

**\$5<sup>00</sup>**

.001-600V  
.002-600V  
per hundred

## FILTER CONDENSERS

Close-out on all the cats and dogs on our shelves!  
You can substitute these for the more expensive  
filter condensers.

40/20—150/25V	30/30—350V
30/30—400/350V	30/30/25—400/25
20/40—450/400V	35/35—300V
35/35—300V	30/10/20—400/25
40/21—250/25V	10/10/10/20—
20/20—300/25V	450/350/150/25

**29<sup>c</sup>**  
ea.

## 6 FOOT LINE CORDS

will be scarce—UL approved cord  
and plug—10 for

**\$1.95**

## TWIN LEAD

55 Web virgin polyethylene, 300 ohm twin lead  
in either clear or brown. 1000 ft. \$19.95  
100 ft. 2.25

# TUBES—Radio and TV

5c per Tube extra for less than 50 tubes  
Individually Boxed—All Brands—Standard Factory Guarantee

**45<sup>c</sup>** ea.

5Y3GT  
35W4  
80  
VT51  
VT52

**54<sup>c</sup>** ea.

5Y4G  
6AT6  
6AV6  
6J5GT  
6SQ7  
6X4  
6X5GT  
12AT6  
12AV6  
12J6GT  
12SQ7  
35Z4GT  
35Z5GT  
117Z3

**59<sup>c</sup>** ea.

0Z4

0Z4G

5U4G

5W4

5W4GT

6AR5

6BF6

6C4

6CSGT

6FSGT

6FGGT

6H6

6K6GT

6SF5

6SQ7GT

12BF6

12SQ7GT

25Z5

25Z5

25Z5

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**65<sup>c</sup>** ea.

12BA6  
12BE6  
12F5GT  
12H6  
12Q7GT  
12SJ7GT  
25L6GT  
35A5  
35L6GT  
35Y4  
35Z3  
45Z5GT  
50L6GT  
50Y6GT

**72<sup>c</sup>** ea.

1N5GT

1R5

1S5

1T4

1U4

354

3V4

6AL5

6AQ5

6AS5

6AU6

6BC5

6BH6

6BJ6

6CB6

6SA7GT

6SC7

6SF7

6SK7GT

6SS7

6US

6V6GT

7A4

7H7

7Q7

12AU6

12SA7GT

12SF5GT

12SF7

12SK7GT

25W4GT

35B5

35C5

41

42

43

45

50B5

50C5

50Y7GT

75

77

78

7A6

7A7

7A8

7B4

7B5

7B6

7B7

7B8

7C5

7C6

7C7

7Y4

7Z4

7Z4

7Z4

7Z4

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7Z4

**79<sup>c</sup>** ea.

6J7G  
6K7GT  
6SH7GT  
6SN7GT  
6USGT  
6U7G  
6USGT  
7A5  
7E6  
7F7  
7N7  
7R7  
7X6  
12A8GT  
12K7GT  
12SC7  
12SH7GT  
12SN7GT  
12SR7GT  
14A7  
14B6  
14B8  
14F7  
24A  
25Z6GT  
35/51  
50A5  
50X6  
85

**87<sup>c</sup>** ea.

3Q5GT  
5V4G  
6AK6  
6BA7  
6K5GT  
6K8GT  
6L7  
6N7GT  
6PSGT  
6SL7GT  
6Y6G  
12AU7  
12AX7  
12BA7  
12BH7  
12SL7GT  
14A7  
14C7  
71A  
117Z6GT  
7193

**95<sup>c</sup>** ea.

1B1GT  
1J5GT  
1LA6  
1LA6  
1LC6  
1LD5  
1LE3  
1LH4  
1LN5  
1PSGT  
1Q5GT  
1X2A  
3LF4  
SZ4  
6AB5/GN5  
6AG5  
6AUSGT  
6G6G  
6LSG  
6R7GT  
6SBGT  
7E7  
7G7  
7J7  
7K7  
7L7  
7S7  
7V7  
7W7  
7X7  
12AH7GT  
12AW6  
12SBGT  
12Z3  
14C5  
14X7  
35Z6G

**\$104** ea.

6AC5GT  
6AC7  
6J6  
6SD7GT  
12AT7  
19T8  
25AC5GT

**\$104** ea.

25Y5  
46  
47  
50C6G

**\$115** ea.

1H6G  
2A3  
6A3  
6AB7  
6AG7  
6B4G  
6B5  
6B8GT  
6BD5GT  
6BN6  
6BQ7  
6C8G  
6D8G  
6F8G  
6J8G  
6J7GT  
6T8  
7C4  
7F8  
12A7  
12AV7  
12C8  
14F8  
25BQ6GT  
32L7GT

**\$140** ea.

5T4  
6AH6  
6AK5  
6NGG  
20  
70L7GT  
117L7  
117N7GT  
117P7GT

6BG6G ea. \$1.73  
6CD6G ea. 2.15  
19BG6G ea. 2.15  
807 ea. 1.95  
813 ea. 9.95

## TV PICTURE TUBES

10BP4.....	\$1195	16JP4.....	\$2995
12LP4.....	\$1995	16RP4.....	\$2995
14PB4.....	\$2295	16TP4.....	\$2995
7JP4.....	\$1795	17BP4A.....	\$3195
		19AP4A.....	\$4495

Catalog of tubes and parts included with each order.

**Order Today!**

**Premier**  
RADIO TUBE CO.

551 West Randolph St.  
Chicago 6, Illinois  
Phone ANdover 3-1590

**WE WON'T BE UNDERSOLD!**

### STANDARD BRAND TUBES

### Receiving • Special Purpose Television

**All Guaranteed**

VR90	1.40	220	1.95	813	7.94
VR130	1.40	221A	.99	814	3.79
CSJ	5.95	231B	1.18	815	1.00
212G	1.40	232	1.00	816	3.79
21222	4.00	234B	1.50	830B	3.79
2122	1.40	235	1.00	831	3.79
2C21	1.40	282B	1.25	837	1.31
2C22	.43	304TH	11.95	838	1.31
2C23	1.40	305	1.00	839	1.31
2C40	6.50	371B	.93	843	27.49
2C41	1.40	372	1.00	844	27.49
2E22	1.59	417A	.925	864	1.00
2J21A	9.50	434A	4.85	885	1.00
2J22	11.25	436A	1.00	886A	2.39
2J26	36.50	449A	6.95	872A	1.00
2J27	36.50	450A	6.95	873	1.00
2J32	67.50	507AX	9.50	878	1.00
2J33	36.50	517L	19.50	885	1.00
2J34	47.95	518	19.50	886	1.00
2K25	27.75	537/BSJ	3.79	935	7.49
2K29	36.50	538	3.79	936	7.49
2V30	.95	702A	2.95	957	1.00
2V31	1.40	703A	2.95	958	1.00
2V32	.54	703A	7.89	959	1.11
3C24	2.19	708A	1.22	991	1.00
3C25	3.79	709A	1.00	992	1.00
3P23	4.75	709A	4.69	1613	1.00
4C25	1.40	710A	1.00	1614	1.00
4C38	15.25	711A	11.95	1619	1.00
4D23	7.95	715A	6.95	1625	1.00
1N	1.40	716A	1.00	1626	1.00
15E	1.09	718C	19.95	1629	1.00
13R	1.40	719A	1.00	1630	1.00
FD17	3.85	719CV	48.50	1633	1.00
2F4R	4.95	718CV	48.50	1639	1.00
2R4	1.40	720A	1.00	1640	1.00
52A	8.45	719A	26.75	1642	1.00
2R4	1.40	721A	1.00	1651	1.00
HP102	11.95	721A	5.95	2051	1.00
ET23A	8.50	722A	3.39	8012	1.25
ET23B	13.75	722A	2.39	8013	1.25
2080	5.49	800	1.95	8025	1.00
211	7.4	801A	.95	9004	.75
212	7.95	802	2.50	9006	.75
217C	8.95	802	3.94	9193	.75

## TV TUBES—All Black

Sheldon, Zetka & Standards only

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COrtlandt 7-0086 • Free Catalog

### Spot Radio News

(Continued from page 18)

the facilities of experimental stations set up to produce test signals. Soon after this proposal appeared *General Electric* announced that they are planning a series of experimental colorcasts using the composite system. Initially still pictures will be used, it was said, and later live programs will be transmitted, all tests being conducted at Electronics Park, in Syracuse, N. Y. Special field pickup receivers will be used for the study program.

The *G-E* announcement was followed by a statement from *RCA*, which disclosed that they, too, would conduct tests, and on an expanded basis, with the general public being invited to look in at compatible-color receivers set up in Exhibition Hall in Radio City. All sets are scheduled to feature use of the tri-color tube, which was announced at the hearings in late '50. With the release of color-test schedule, there also appeared the news that all of the company's licensees now had information disclosing how the tri-color tube was made and also how receivers using the tube can be produced. In fact, the licensees, of which

duced. In fact, the licensees, of which there are over 300, also received complete kits of parts and color tubes, so that they might build pilot models, for lab and field evaluation. Even CBS' newly acquired set company, an RCA licensee, received the tube and chassis details. The latter incident prompted many to recall the blistering letter RCA's Prexy Frank Folsom wrote to FCC, regarding the release of the color tube to CBS. In that historic reply, Folsom said in part: "We were both shocked and surprised at your request, coming only a few weeks after your color decision. Already it is evident that your attempt to force an incompatible system on the American public has backfired. . . . Nothing, not even our tri-color tube, can remedy the basic defect of the system you adopted, namely its total inability to receive any picture whatsoever on the 9,000,000 sets outstanding in the hands of the public today. (Note: According to RTMA there are nearly thirteen-million receivers now installed.) . . . Your action in adopting standards for a system . . . which uses spinning discs, instead of an all-electronic system which requires use of color tubes, has disrupted and delayed our previously contemplated program for factory production and commercial sales of color sets and tri-color tubes. . . . In spite of the handicaps imposed by the FCC upon our program of experimental research, we are continuing that work with the objective of developing for the public the best tri-color tubes that can be made. . . . Until we have completed our research work, we will not be able to make models of our tri-color tubes available to others."

The bitterness, current in some plants, not only because of the green-light for motor-driven color, but because of extravagant promises made in some quarters, which it is claimed have caused sales slumps, raced through an important FTC session in Washington where more than one-hundred representatives of industry gathered to confer about trade practices and rules proposed by RTMA, NARDA, NTDA, and a picture-tube association. Particularly critical was Richard Salant of CBS, who during one point declared that the present definition of TV receivers ignores the color set, a comment which prompted Emerson's Prexy Ben Abrams to say that radio sets are still called receivers, whether they do or do not receive FM or short-wave, and TV sets would be considered as receivers, whether they were for color or black and white. Some did feel that a coined descriptive term might help in quickly differentiating between the two types of sight and sound sets. Shortly after this clash of words, Salant again rose to object to the RTMA rule which noted that it was not proper to declare in advertising that any set can be adapted to receive color broadcasts in black and white, unless there also appeared the statement that the resulting monochrome picture would contain . . . "materially less picture detail than a standard black and white broadcast picture." To this criticism Abrams also replied, declaring that the Commission had officially noted that the CBS system produced a . . . "degraded black and white picture." Salant angrily denied that such an interpretation appeared in the text, adding that perhaps the CBS picture had less geometric detail, but this did not mean an inferior picture. This remark prompted RTMA's new president, Glenn McDaniel, to state the Columbia picture was inferior because it represented about sixty per cent fewer dots.

Many pointed out that the sharp rejoinders at the FTC meeting reminded them of the barrage of verbiage which followed the FCC approval of the field sequential system, particularly the blast aired by RTMA's board chairman, Bob Sprague, who said that the manufacturers . . . "believed and still believe that the action (by FCC) was unwise." Pointing out that there were two reasons why it was believed that black and white pictures will continue to provide the best television entertainment for years to come, Sprague said then that first, it was industry's . . . "profound conviction, the FCC to the contrary notwithstanding, that the right kind of color television system simply isn't here yet." In addition, he pointed out, there is an equally firm belief that black and white television will never be obsolete . . . "even when a sound color system has been developed." Chiding the Commission and CBS for their lack of familiarity with manufacturing and sales, Sprague declared during his broadcast that neither have ever

sold radio and television to the public and thus the problem of converters or adapters was a bit foreign to them. Frankly, he said, he was more inclined to . . . "take the opinion of set merchandisers, who know by long experience that the public, especially the housewife, does not want any extra gadget or gadgets on her receiver, whether for radio or television." Describing the trend to larger sets, Sprague had pointed out that it is a . . . "fair assumption that only a very small percentage of present TV set owners will buy converters.

**HEARINGS**, during which FCC Headman Wayne Coy's reappointment to a new seven-year term was being considered, also teemed with comments on color. Particularly interesting were the personal views of Coy, who reported during questioning by the Senate Interstate Commerce Committee, that the Commission would have preferred a compatible system.

**THE TV-AIR FREEZE**, which it appeared was really ready for a genuine thaw, has again been iceberged, and this time through no fault of the Commission, but because of a brief issued by the Federal Communications Bar Association and a resolution introduced by Senator William Benton, the brief declaring that the proposed block allocations were illegal and the resolution asking for six-month to a year's delay to reconsider the freeze and the program proposed to remove the freeze, through an investigation by a Congressional committee.

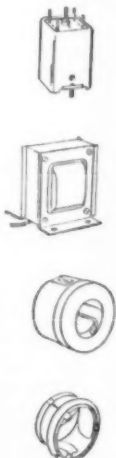
The bar association move was considered so serious that Senator Edwin Johnson penned a long letter to Wayne Coy, which said that the legal points raised appear to be of . . . "such grave public interest, that I, as chairman of the Committee on Interstate and Foreign Commerce, believe it is my duty under the Congressional Reorganization Act to express my views . . ." If the Commission would consider the legality of its allocation plan, the Senator declared, and . . . "find that it is contrary to the provisions of the Communications Act as charged . . . vital time would be saved and the funds and the energies of the government and the applicants would not be wasted." The Senator pointed out that if . . . "the Commission's plan were merely adopted as a guide . . . for the development of a fair, efficient and equitable distribution of television service, applicants would have an opportunity to be heard for any channel without the necessity of first going through a rule-making proceeding . . . Under such a procedure the plan would not be vulnerable to adverse legal action." According to the committee chairman, television should become available as quickly as possible to those in areas long denied this privilege, and any doubts . . . "as to the legality of the Commission's proposal should be settled immediately to further this objective." . . . L.W.

August, 1951

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FOR "ORIGINAL" RCA TV COMPONENTS



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TV  
ANTENNAS

List Price \$17.00

SPECIAL \$7.95

Here's the best price we've seen on FIRST QUALITY TV antennas. Concord made a special purchase from a famous manufacturer whom we can't name because of the low price we're asking for his antennas. Look what you get! An in-line all band antenna that provides higher gain and broader response on all channels. Large center folded dipole for the 54-88 MC band serves as reflector for the small folded dipole (174-216 MC). Single direction radiation pattern throughout entire TV spectrum and excellent impedance match. All aluminum elements pre-assembled.

SINGLE BAY ARRAY complete with 5' steel mast, swivel mtg. plate, guy clamp, stand-off insulators. Less 300 ohm twin lead. List \$17.00.

98-21817R--Shpg. Wt. 9-1/2 lbs. Net... \$7.95

TWO BAY ARRAY. Double stack of above with connectors and two 5' sections of steel mast and brackets. Less 300 ohm lead. 98-21818R--Shpg. Wt. 14-1/2 lbs. \$14.95

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**FILL IN AND MAIL TODAY**

# NEW TV PRODUCTS on the Market.....

## ANTENNA ROTATOR

Walco Products, Inc. of 60 Franklin Street, East Orange, New Jersey is currently in production on a new television antenna rotator, the "Walco Rotenna."

The new unit supplies a guaranteed minimum of 50 inch-pounds of starting



torque from a small but powerful motor weighing less than 3½ pounds and measuring only 4" x 4" x 7½". It is equipped with a selsyn motor type dial indicator which shows the exact position of the antenna at all times. The indicator is easily calibrated at each individual location and small numbers are supplied loose and may be fixed to the dial face when each channel position has been established.

The rotator accommodates mast sizes from 1" through 1½".

## CR SCOPE

Precision Apparatus Co., Inc., 92-27 Horace Harding Blvd., Elmhurst, Long Island, New York is currently introducing a new high-sensitivity cathode-ray oscilloscope, the Series ES-500A.

This new unit is a 5" laboratory type



instrument with extended range, voltage regulated, push-pull amplifier for multi-purpose industrial, AM, FM, and TV applications.

The Series ES-500A features response beyond 1 mc., 2 megohm input resistance, approximately 20 µfd. input capacity, and regulated voltage for utmost stability. The better than 20 milivolt-per-inch vertical amplifier sensi-

tivity permits direct alignment and/or adjustment of low gain circuits and examination of minute signal levels. The multivibrator type internal linear sweep circuit provides direct coverage from 10 cycles to 30 kc.

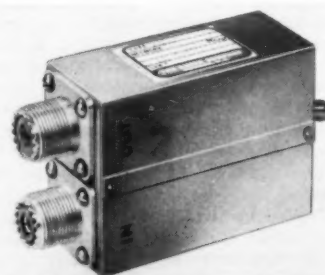
Literature and additional information on this new unit may be secured by writing G. N. Goldberger at the company address.

## VIDEO ROLL-OFF NETWORK

The Daven Company, 191 Central Avenue, Newark 4, New Jersey has developed a new video roll-off network, the Type V-103.

This new unit is designed to provide the standardized bandwidth required when performing operating measurements. It meets all standards on television methods of measurement and is widely used in television stations and laboratories.

The frequency characteristics provide a 6 db roll-off at 3 mc. with refer-



ence to the low frequencies. The circuit provides a rise time of approximately .175 microsecond without overshoot. The circuit is a three-mesh, 73 ohm constant impedance network. A suitable switch is provided for straight-through operation which removes the network and restores the original wide-band characteristics of the scope. "In" and "Out" connectors are provided for inserting the network in the line.

## U.H.F. TRANSMITTER

A new low-cost u.h.f. television transmitter, designed especially for the small town station, is currently undergoing tests at the General Electric Company's Electronic Park in Syracuse, New York.

The transmitter operates in the u.h.f. channels which have been proposed by the FCC for nation-wide expansion of television. Commercial stations are expected to start operation in these u.h.f. channels late in 1952 or early in 1953. A special antenna will be used with the transmitter to give it an effective radiated power of about two kilowatts.

The transmitter is designed to pro-

**RADIO & TELEVISION NEWS**



## FIRST MAJOR ADVANCE IN TV ANTENNAS!

# GET 360° ALL CHANNEL COVERAGE

- ★ **No Motors or Moving Parts!**
- ★ **No Electric Power!**
- ★ **No Roof Orientation!**
- ★ **No Ghosts!**

## Snyder's 360° MOTORLESS DIRECTRONIC TV AERIAL SYSTEM

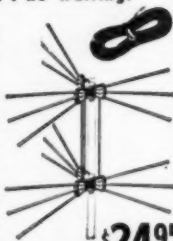
- ★ **The antenna system everybody will want for new installations!**
- ★ **The antenna that will replace all present obsolete installations!**

### ELECTRONICALLY SWITCH-BEAMED TO COVER ENTIRE 360° AREA!

**Flick of the switch clears picture instantly . . . no waiting.**

#### For Ultra Fringe USE DOUBLE STACKED ANTENNA SYSTEM 360° Coverage

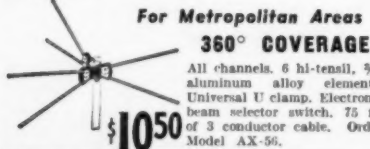
All channels. 18 hi-tensil, 3/8" aluminum alloy elements. Complete with 3 mating 1 1/2" steel mast sections, 11 ft. erected, Universal U clamp. Electronic B + A selector switch. Set of connecting stubs, 75 ft. of 3 conductor cable. Guy ring. Adj. mtg. base. Order Model TX-599.



Complete \$24.95

#### SERVICEMAN'S 360° ARRAY \$21.75

Same as above less mast sections, guy ring, and adj. mtg. base. Order model AX-599.



#### For Metropolitan Areas 360° COVERAGE

All channels. 6 hi-tensil, 3/8" aluminum alloy elements. Universal U clamp. Electronic beam selector switch. 75 ft. of 3 conductor cable. Order Model AX-56.

#### TV ANTENNA ACCESSORIES

STEEL EXT. POLES. Weather Treated  
10 ft. long, 1 1/2" di. . . . . \$2.19  
5 ft. long, 1 1/2" di. Crimped end. . . . . 1.35  
3 1/2 ft. long, 1 1/2" di. Crimped end. . . . . 1.19  
3 CONDUCTOR CABLE per foot. . . . . .04

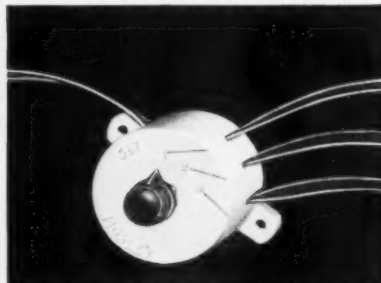
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RADIO PARTS CO., Inc.**  
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**BALTIMORE 1, MD.**

vide for higher power operation if the station owner desires to expand his coverage. This can be accomplished by the addition of an amplifier which would increase the effective radiated power to at least 100 kw.

#### TV ANTENNA SWITCH

Mosley Electronics of Overland, Missouri has developed a new three-position television antenna switch that can



be mounted inside or on the back of a television set, on the wall, baseboard, or windowsill.

Designated the No. F-20, the new unit is designed to provide efficient switching facilities in any TV installation where up to three antennas are used and where installation of a flush type is not feasible.

The new unit consists of a special constant impedance rotary switch employing low resistance silver-to-silver contacts on phenolic insulation and enclosed in a molded plastic case. Switch positions are clearly marked on the face of the unit and leads of standard 300 ohm transmission line are brought out of the case for easy connection to the set and to the three antenna transmission lines.

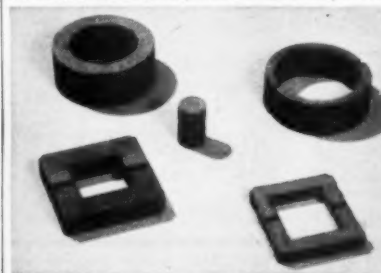
#### ALUMINUM TOWER

Alproco, Inc. of Kempton, Indiana and Mineral Wells, Texas is in production on a new large diameter aluminum tower that will accommodate all popular rotators internally.

A special rotator adapter kit is now available as an accessory to this tower or an adapter plate can be purchased singly. A 22 per-cent increase of strength over the older model tower is claimed and technicians will appreciate the fact that steps are now included as standard equipment.

#### NON-CRITICAL FERRITES

Ferroxcube Corporation of America, 50 East 41 Street, New York 17, New



York has developed a new line of high permeability ferrite parts using non-critical materials.

Transformer cores, deflection yoke cores, antenna cores, and permeability tuning cores for television and electronics are now available in Ferroxcube 3 and 3C materials, which are nickel-free.

Complete technical information on these materials is contained in Engineering Bulletin FC-5101, available on letterhead request.

#### NEW TV TUBE

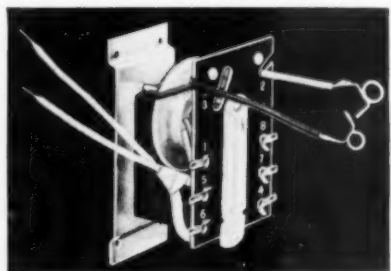
American Television, Inc. of Chicago, Illinois, has announced a new and less costly television picture tube, developed under the direction of Dr. Lee de Forest.

The new tube incorporates an unusual focus which eliminates the expensive magnet thus saving two pounds of copper and several pounds of steel per set. This special tube also features corrective contrasts which means that the tube will provide contrasts that are not inherent in the set itself.

This image-orthoscope is being used in the receivers being produced by one manufacturer at the present time.

#### FLYBACK TRANSFORMER

RAM Electronics, Inc., South Buckhout Street, Irvington-on-Hudson, New York has recently announced the



availability of its new Model XO53 flyback transformer.

Specially pattern-wound, the new unit generates 16 kv. for both the regular deflection and the new electrostatic deflection picture tubes, up to and including the 20" size.

According to the company, the new XO53 provides excellent regulation and linearity control and needs no special width and linearity coils. Even at maximum operating voltages the new unit is said to produce no Barkhausen oscillations, ringing, whistle, or corona.

The company will supply complete details on request.

#### 4-ELEMENT BEAM

JFD Manufacturing Company of 6101 Sixteenth Avenue, Brooklyn 4, New York has added a new series of 4-element yagi television antennas to its line of TV equipment.

Incorporating twin directors, collector and reflector elements, cut to exact channel wavelength, the new yagi provides good forward gain, sharp horizontal directivity, and reduced interference.

These new antennas also incorporate the company's "Quik-Rig" feature

**RADIO & TELEVISION NEWS**



which permits the elements to be snapped into place and tightened for immediate assembly. A stepped-up driven element provides a direct match to 300 ohm impedance.

Illustrated literature describing these and other antennas in the company's line is available on request.

#### ION TRAP

The Indiana Steel Products Company, Valparaiso, Indiana has announced a new ion trap which has been tradenamed the "E-Zee-On."



The new unit possesses a uniform field pattern and can be adjusted in the matter of seconds with one hand. It is a slip-on, grip-snug beam bender made of one-piece, permanently magnetized Cunife that can't be put on backward and requires no manual clamping.

A descriptive folder on the new ion trap is available from the company.

#### BUILT-IN FOCUS

Development of a new cathode-ray picture tube incorporating 100 per cent built-in automatic focus has been announced by the Allen B. Du Mont Laboratories, Inc. of Clifton, New Jersey.

The new tube eliminates the need for a focus coil, a focus control, or other focusing mechanism presently used in all existing types of magnetic and high voltage electrostatic cathode-ray picture tubes.

A new type of electron gun which eliminates external focus attachments is the heart of the new tube. Pilot production has already started on the new tube.

#### TV BOOSTER

Sonic Industries, Inc., 221 West 17th Street, New York, New York is currently in production on a new television booster, the Model IT 7.



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How to Get Best Results with a Klipschorn, by Paul W. Klipsch

The originator of the Klipschorn discusses the principles of sound reproduction and the equipment which gives best performance with his system.

Audio Nerve Center, by Alan C. Masy

A discussion of the purpose, design, and performance of various types of pre-amplifiers and control units used in conjunction with audio systems.

Repertory Unlimited, by C. G. Burke

An authority on recorded music explains why so many classical and modern compositions are excluded from public performance, and tells how the recording companies are making these "lost" compositions available.

For Your Inspiration, by Philip C. Kelsey  
Illustrations of custom installations; a discussion of their how and why.

New Designs for Speaker Enclosures  
Suggestions from manufacturers for handling the speaker enclosure problem.

When You Buy an Audio Amplifier, by Robert E. Newcomb

The president of Newcomb Audio Products discusses factors of amplifier design which should be considered when purchasing high-fidelity equipment.

Improved Base Reproduction, by Charles Fowler

A detailed review of the development and advantages of the FAS system.

Records for Children, by Beatrice Landeck

Wise selection records can develop, as well as entertain, children.

New Method of Phonograph Mounting, by Irving Greene

A clever and original method of mounting a phonograph in a small space.

Factors to Consider in Buying a Speaker, by William H. Thomas

The author is president of James B. Lansing Sound, and is widely known as an engineer and designer of highest quality reproducing equipment.

The Viewer's Amplifier, by Melvin Sprinkle  
Construction details of a compact amplifier which will improve TV audio.

Records in Review, by John F. Index

A detailed review of the outstanding record releases during the past month.

## High-Fidelity

Published by Milton B. Sleeper  
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500 MA Filter Choke. 6 Henrys. 30 ohms DC resistance. Fully Cased.....**\$4.95**

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W—Weston S—Simpson  
S—Special Scale  
SQ—Square Case

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0-100 MA. WH.....2.45  
0-200 MA. S.....2.95  
0-2 AMP RF. S. SQ.....2.95  
0-4 AMP RF. GE.....2.95  
0-30 AMP DC. GE.....2.95  
0-300 VDC (0-1 ma) 3.45

### 3" Meters

0-4 KV. DC. HS.....\$7.95  
0-2 MA. S.....4.50  
0-15 MA. GE. SQ.....3.95  
0-20 MA. WH.....2.95  
0-20 MA. S.....2.95  
0-30 VOLT DC. DA. 2.75  
0-200 MA. GE.....4.80

## PIGTAIL MICAS

MMF: 5, 20, 50, 60, 100,  
250, 300, 400, 500, 750,  
800, 1000, 2000, 3000,  
4000, 5000, 6000,  
10000.....\$0.09 ea.

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.....\$0.05 ea.

**Silver Mica Capacitors**  
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750, 780, 1000-50.12 ea.

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Ohms: 500, 2000, 12,500  
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**Heavy Duty 4 Conductor**  
Rubber Covered Cable.  
10 per foot

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2 to 12 Henrys, 1 Amp to 100 Ma. 15 Ohms DC fully cased. High voltage insulation, ceramic insulators. Very conservatively rated. Weight 60 Lbs. \$16.95 ea.

## Meter Multipliers

1 Meg. 1/5 of 1% Cage  
Enclosed 1 KV.....\$2.95  
2 Meg. 1/2 of 1% Tubular  
2 KV.....\$2.95  
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4 KV.....\$3.95

## GE KV METER

0-15 KV DC. 3 1/2" SQ.  
Bakelite case. 500 UA  
movement. Includes 30  
Meg. 1% Ext. multiplier.....\$15.75 ea.

## BAKELITE CASED MICAS

MFD	VDC	Price	MFD	VDC	Price	MFD	VDC	Price
.001	600	\$1.18	.024	1500	\$1.55	.001	5 KV	\$1.60
.002	600	.24	.024	1500	.75	.0015	5 KV	1.60
.01	600	.26	.02	2 KV	.90	.003	5 KV	1.90
.02	600	.26	.002	2500	.45	.005	5 KV	2.50
.01	1 KV	.45	.004	2500	.30	.0003	8 KV	2.50
.002	1200	.35	.0001	5 KV	.70	.0005	8 KV	2.50

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20 watt ohms: 50-70-100-300-750-1K-1.5K.....20 ea.  
2.5K-2.7K-5K-10K-20K.....22 ea.  
30 watt ohms: 100-2500-5300-10K.....22 ea.  
100 watt ohms: 100-3750-1500-2K, 10K, 20K, 25K-50K......59 ea.

## GUARDIAN LATCHING RELAY

SPDT, 110 V 60 cy Coil, 15 Amp Contacts.....\$1.95

## ADJUSTABLE SLIDER RESISTORS

20 Watt: 1, 50 Ohms.....\$0.25  
50 Watt: 500 Ohms......35  
75 Watt: 100, 150, 200 Ohms......39  
100 Watt: 50, 100 Ohms......49

## MISCELLANEOUS BARGAINS

25 ohm 675 watt Rheostat.....\$2.95  
50 meg 35 watt Resistor......99  
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Ceramic RF Switch SP 15 Pot......89  
4PDT Relay, 4500 Ohm DC Coil.....1.95  
.05 600V Oil Tubular.....12 for  
10K, 15K Pots.....4 for  
5-20 mmf Ceramic Variable......24  
1.5-2 mmf Ceramic Variable......24  
5PST Push Button Switch......29  
SAS MFD 400 VDC Oil......39  
1x1x1 MFD 1200 VDC......59  
Fil Transf. 2 1/2 V CT, 40 AMPS, 110V CY.....6.95  
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## HIGH WATTAGE ANTENNA RELAY

110/220 Volt 60 Cy. coil, 5000 Volt, 15 Amp contacts, OPST. Ceramic insulation.....\$9.95 ea.

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Retailing in the moderate price class, the new unit is said to deliver a high usable gain with full bandwidth and high signal-to-noise ratio.

Complete information on this new unit is available from the company.

## 24" TUBE CHASSIS

Video Products Corporation of 2061 Broadway, New York 23, New York has recently introduced a new television chassis which is designed for custom installations.

The new version of the 630 chassis has been designed for use with the 24



inch cathode-ray tube. Designated the Model K24, this new 30 tube chassis incorporates all of the features of the standard 630 plus the additional high voltage of 16 kv. for increased brightness and contrast range. A new full focus yoke is provided for sharp edge-to-edge focus.

## LIGHTNING ARRESTER

A new lightning arrester designed for outdoor as well as indoor use has just been developed by the Tube Department of Radio Corporation of America.

An inexpensive plastic and metal de-



vice, the new 215X1 is designed to match 300 ohm line without cutting or splicing the line.

## BRIGHTNESS TESTER

Photovolt Corporation of 95 Madison Avenue, New York 16, New York has developed a video brightness tester for measuring the brightness of television tubes, screens, and cathode-ray tubes.

The new Model 205 was designed for laboratory tests, production control, installation, and servicing. When the photocell is held to the face of the tube, the instrument indicates the

brightness directly in foot-lamberts. The range extends to 100 foot-lamberts, thus covering the highest brightness values encountered. The 4" scale length is expanded for accurate measurement of low brightness values, 20 foot-lamberts being approximately at mid-scale.

The entire instrument is built into a portable wooden housing measuring 6 1/2"x7 1/2"x3 1/2".

-30-

## Within the Industry

(Continued from page 26)

New York as a successor to the **WAR-SAW BUTTON COMPANY**. The firm will expand its production of control knobs for radio and television receivers and add new products from time to time.

**AMPEREX ELECTRONIC CORPORATION** has announced plans to build a modern one-story steel and concrete building on a recently-acquired tract on Duffy Avenue, Hicksville, Long Island. The additional facilities will be used for the manufacture of tubes...

**WALTER L. SCHOTT COMPANY** recently opened a new plant at 3224 Exposition Place, Los Angeles, with appropriate ceremonies. The new facility provides 31,000 square feet of production space for the manufacture of the company's line of radio and television parts and antennas...

**EUTECTIC WELDING ALLOYS CORPORATION** has completed a modern administration building at its Flushing, New York location in which the offices of the company, its various branches, and the *Eutectic Welding Institute* will be housed...

**JFD MANUFACTURING COMPANY** has purchased a new site in Brooklyn for the construction of a new 120,000 square foot plant. The facilities will be used for expanding the company's production of television parts and accessories...

**MODULATION PRODUCTS COMPANY** has moved to new and larger quarters at 56 Linspenhard Street, in New York...

**LENKURT ELECTRIC CO.,** San Carlos, California, has recently completed a new 19,000 square foot addition to its factory and laid the foundations for 30,000 square feet of additional manufacturing and warehouse facilities... **THE GRAYBAR ELECTRIC COMPANY** has opened new Eastern district headquarters at Bridge Plaza North and 21st Street in Long Island City...

**I.D.E.A.,** manufacturers of the "Regency" booster, is building a new factory in Lawrence, Indiana which will house laboratory and office facilities as well as production assembly lines...

**RADIO CORPORATION OF AMERICA** has opened a new tube manufacturing plant in Cincinnati, Ohio. The plant is dedicated to the memory of John G. Wilson, late executive vice-president in charge of the **RCA VICTOR DIVISION**...

**SYLVANIA ELECTRIC PRODUCTS INC.** will build a new metallurgical laboratory at *Sylvania Center*, the company's 57 acre research site at Bayside, Long Island.

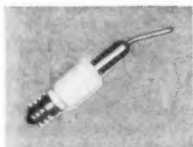
-50-



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No. 537-C 1/8" PENCIL TIPS, 20 Watts For Light Duty Work. Recommended for small meters and instruments, small joints and hard-to-reach points on radio and TV, printed circuits, delicate electronic assemblies, aircraft instrument repair, hearing aid assembly and repair.

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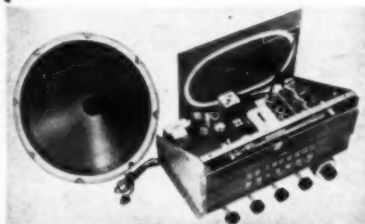
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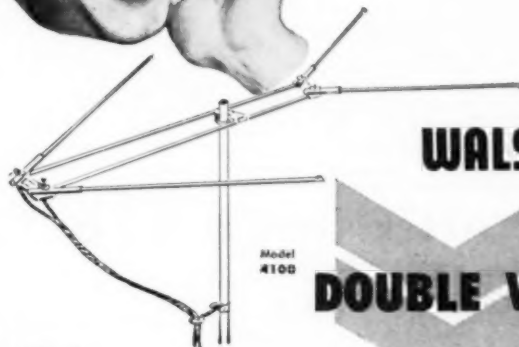
Rated an excellent instrument by America's foremost electronic engineers. Fully licensed under RCA and Hazeltine patents. The photo shows the Espey Model 511-B, supplied ready to play. Equipped with tubes, antenna, speaker, and all necessary hardware for mounting.

**NEW FEATURES**—Improved Frequency modulation circuit, drift compensated • 12 tubes plus rectifier, and pre-amplifier pick-up tubes • 4 dual purpose tubes • High quality AM-FM reception • Push-pull beam power audio output 10 watts • Switch for easy changing to crystal or variable reluctance pick-ups • Multi-tap audio output transformer supplying 4—8—300 ohms.

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- Popular types in quantities correctly proportioned as determined by popularity of sales for replacement.
- Individually packed by type and capacity in handy plastic kit.
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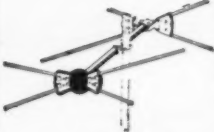
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Here's a complete antenna array ready to satisfy your most critical customers. It's all-channel, made of hi-tensile aluminum alloy elements.

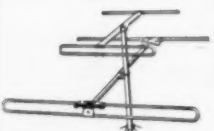


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Mount this fine antenna in your customer's window. Perfect for apartments, hotels and office installation.

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**Model TV-55**  
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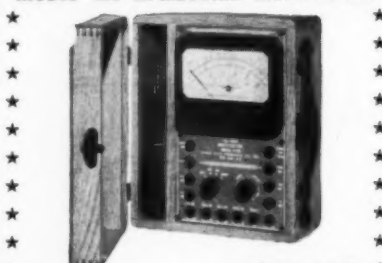
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MODEL 450 HI-MEGOHM MULTITESTERS



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OUTSTANDING FEATURES of these Multitesters are the desirable extremely high megohm range of 30 megohms available that can not be obtained with other direct reading meter instruments. No batteries nor tubes are used in these circuits. Long scale 4 1/2" meters accurate within 2%. Output ranges correspond to the AC voltage ranges. Bench type or open face models have dimensions 8 1/2" x 5 1/2" x 3 3/4". Weight 3 lbs. Portable models designated "P" are in attractive natural finish oak cases with leads. Case has hinged cover with latch and leather handle. Dimensions, 8 1/2" x 7 1/2" x 4 3/4". Weight 4 1/2 lbs.

**MODEL 450A—1000 OHMS Per Volt Meter Sensitivity.**  
OHMMETER: 0-5000-500,000 Ohms, 0-50 Meg.  
DC VOLTS: 0-5-50-125-500-2500.  
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MODEL 450AP—(Portable) . . . . . **\$27.95**

BUY FROM YOUR JOBBER. INSIST ON RCP INSTRUMENTS. WRITE FOR CATALOG RN-8

**RADIO CITY PRODUCTS CO., INC.**  
152 West 25th Street RCP New York 1, N.Y.

## Round-The-World (Continued from page 37)

just a big powerful modulator. We also have a smaller modulator called a GM8 which combined with the 12-ACX transmitter gives an 800 watt, two-channel telephone combination. In Canada and in Bermuda there are some Canadian Marconi transmitters of 5 kilowatts' power which are of the same type as the Federal FTR-3 and the Wilcox 96-C.

On the ground we have two basic types of receivers. One is the single channel fixed-frequency receiver. There are several kinds of these including the Collins 5IN2 and the Wilcox type F-3. The other basic type is a modified tunable receiver which has a crystal locking in the oscillator to provide frequency stability. We have modified a number of National NC 240 receivers in this manner. We have tuned plug-in operation for the crystals so that we can lock the receiver on any frequency within its basic range. We always provide a separate receiver for each frequency to be covered at each station. In case of failure any receiver can be set-up on any frequency as long as crystals are available. However, at all the new stations we are installing the newer single-channel, crystal-controlled receivers.

There are three aircraft transmitters used by Pan-American in the Round-the-World Voice Radio System. One is the transmitter section of the Collins 18S transceiver, which covers 20 frequencies between 2 and 20 mc., and, like the aircraft receivers, is remotely controlled from the cockpit. The Collins 18S is a 100 watt transmitter.

Another transmitter in use is the PAA 100AX12. This is a 12 channel, 24 frequency unit which has a motor-driven turret mechanism very similar to the ACR 24 receiver. Power is 100 watts with a frequency range from 2-20 mc. We also have a number of the old Collins military transmitters, type ART 13. This transmitter was originally a ten-channel job, automatically tuned and self-excited. We modified it to crystal control for 20 frequency, ten channel operation. The crystal section is removable and a new set on 20 frequencies can be installed and the transmitter retuned by a good radio mechanic in about 20 minutes.

The aircraft receivers were of several types but we have now standardized on two receivers. One is an ACR-144 receiver which was designed by Pan-American. The original receiver covered 24 frequencies, crystal-controlled, and had a frequency range from 2 to 20 mc. It's all in a 1 ATR size box about 8" high, 10" wide, and 18" deep and has a motor-driven turret system which selects the proper coil and crystal system for changing frequencies. The first modification of this receiver provided three crystals in each channel which gave us a maximum of 72 frequencies as long as the

**RADIO & TELEVISION NEWS**

frequencies set up in each channel did not vary by more than 3%. We are now modifying all receivers to accommodate six frequencies in each channel. The other receiver used is a ten channel, 20 frequency unit which is a part of the Collins 18S transceiver.

As the system has expanded we found that we had to provide airborne equipment which would accommodate a large number of frequencies. Most of the aircraft equipment available had a maximum of 20 frequencies, so we designed new receiver equipment which would cover as many as 144 frequencies. We are now designing transmitting equipment that will accommodate up to 144 frequencies. Meanwhile we have an interchangeable crystal holder which fits into the 20 frequency transmitter and which can be changed quickly.

The results of the Round-the-World Voice Radio System to date have been highly satisfactory. Direct communication between the pilot of the aircraft and the ground station has increased both the speed and clarity of transmission.

-30-

## BALTIMORE HAMFEST

**T**HE Fourth Annual Hamfest Picnic of the Baltimore Amateur Radio Communications Society will be held on August 19 at Triton Beach, Mayo, Maryland.

Tickets will be \$1.00 per person at the gate and includes bathing, bath locker, picnic table, pavilion, parking lot, and ball field privileges.

The club station, W3PSG, will be in operation on 10 meter phone for the benefit of mobile hams and a special prize will be awarded for the best mobile installation.

For further information on this hamfest write Chairman Ernie Dobos, W3JCL, 2203 Fulton Avenue, Baltimore 17, Maryland.

-30-

When the Sprague Electric Company of North Adams, Mass., recently celebrated its 25th anniversary, three generations of Spragues were on hand for the cake-cutting ceremony. Robert C. Sprague, president of the company and chairman of the board of the Radio-Television Manufacturers Association, serves the first slice to his grandson, Robert C. Sprague III, while his son, Robert C. Sprague, Jr., steadies the boy's hand. Participating in the ceremonies are Vice-President Julian K. Sprague and Miss Mollie Avery, assistant secretary of the company and its first employee.



August, 1951

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APN-1 Altimeter Indicator 0-1 ma. shunt, 250° dial New \$2.95  
Sound Powered Head and Chest Sets—U.S. Instrument Co. GOOD \$4.95 ea. \$8.50 pr. FAIR 2.95 ea. \$5.00 pr.  
BC-464 Target Battery—5 channel control sensitive relays, battery case antenna 68-73 mc. ....NEW \$ 14.95  
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9CW3 Receivers in 113A Bay. ....EXCELLENT 600.00  
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AN/APN4A Complete .....EXCELLENT 125.00  
2" Aircraft Meter 1-0-1 milliammeter scale calibrated 50-0-50 .....NEW 1.95  
PE-218 Inverter 400N .....NEW 29.50  
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Weston Model 545 Tach. Meter. ....NEW 17.50

One of the largest and most complete electronic surplus stocks in the country. We have thousands of tubes, capacitors, plugs, accessories, transmitters-receivers, test equipment, etc. Send us your requirements.

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The Progressive Radio "Edu-Kit" offers you a home study course at a rock bottom price. Our Kit is designed to train Radio Technicians, with the basic facts of Radio Theory and Construction Practice expressed simply and clearly. You will gain a knowledge of basic Radio Principles involved in Radio Reception, Radio Transmission and Audio Amplification.

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### THE KIT FOR EVERYONE

The Progressive Radio "Edu-Kit" was specifically prepared for any person who has the desire to learn Radio. The Kit has been used successfully by young and old in all parts of the world. It is not necessary that you have even the slightest background in science or radio.

The Progressive Radio "Edu-Kit" is used by many Radio Schools and Clubs in this country and abroad. It is used by the Veterans Administration for Vocational Guidance and Training.

The Progressive Radio "Edu-Kit" requires no instructor. All instructions are included. All parts are individually packaged and identified by name, photograph and diagram. Every step involved in building these sets is carefully explained. You cannot make a mistake.

### PROGRESSIVE TEACHING METHOD

The Progressive Radio "Edu-Kit" comes complete with instructions. These instructions are arranged in a clear, simple and progressive manner. The theory of Radio Transmission, Radio Reception and Audio Amplification is clearly explained. Every part is identified by photograph and diagram; you will learn the function and theory of every part used.

The Progressive Radio "Edu-Kit" uses the principle of "Learn by Doing." Therefore you will build radios to illustrate the principles which you learn. These radios are designed in a modern manner, according to the best principles of present-day educational practice. You begin by building a simple radio. The next set that you build is slightly more advanced. Gradually, in a progressive manner, you will find yourself constructing still more advanced radio sets, and doing work like a professional Radio Technician. Altogether you will build fifteen radios, including Receivers, Amplifiers and Transmitters.

### THE PROGRESSIVE RADIO "EDU-KIT" IS COMPLETE

You will receive every part necessary to build 15 different radio sets. This includes: tubes, tube sockets, variable condensers, electrolytic condensers, mica condensers, paper condensers, resistors, tie strips, coils, tubing, hardware, etc. Every part that you need is included. In addition, these parts are individually boxed, so that you can easily identify every item.

### TROUBLE-SHOOTING LESSONS

Trouble-shooting and servicing lessons are included. You will be taught to recognize and repair troubles. While you are learning in this practical way, you will be able to do many a repair job for your neighbors and friends. And charge fees which will far exceed the cost of the Kit. Here is an opportunity for you to learn radio and have others pay for it.

### FREE EXTRAS IN 1951

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- ELECTRIC SOLDERING IRON
- BOOK ON TELEVISION
- RADIO TROUBLE-SHOOTING GUIDE
- MEMBERSHIP IN RADIO-TELEVISION CLUB
- CONSULTATION SERVICE
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ELECTRONICS CO.**

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DEPT. RN-8 BROOKLYN 11, N. Y.

## International Short-Wave

(Continued from page 56)

now called "A Voz do Brasil" and is radiated over all Brazilian stations 1730-1800 daily except Sun. *Radio Tupi*, Rio de Janeiro, ZYC9, 15.364, QSL's only if an IRC is enclosed; has nice card; a new oscillator stage is under construction and soon ZYC9 should be on 15.37 again. *Radio Brasil*, Campinas, state of Sao Paulo, has moved from 2.46 to 4.755; call is ZYY3; 1 kw. (Serrano, Brazil)

Timbiras, Maranhao, ZYY9, 4.975, noted 1730 with "Voice of Brazil" program (presumably is in Portuguese—KRB). Difusora de Manaus, Amazonas, ZYSS, 4.955, heard 2007 with strong level. Tamandare, Pernambuco, noted on 3.265 with Brazilian music, strong signal but with CWQRM; call not known. (Dyrekto, Brazil) Recife, 9.565, noted with "Brazil Calling" (English) week-days 1900-1915, good level. (Young, Ky.) PRB9, 9.505, *Radio Record*, Sao Paulo, heard 0415. (Machwart, Mich.)

**British Honduras**—No sign lately of Belize, 4.96, around 1800-1930; only QRM and QRN noted there. (Pearce, England; Bellington, N.Y.; Stark, Texas) This one may have been a "clandestine" or "pirate" outlet.—KRB

**Bulgaria**—*Radio Sofia's* new high-powered transmitter on 15.33 noted with news 1500 and 1600 (probably for Europe) but announced as on a wavelength of 49.42 meters (6.070). (Fried, Mich.) Also has *English* for North America 2000-2015, 2300-2315. At other periods during the evenings (EST), relays *Radio Moscow's English* broadcasts to North America. (Bellington, N.Y.; Balbi, Calif., others) Noted signing off 2315 and announcing 19.57 m. (15.33). (Nichols, W. Va.) Good on West Coast 2300 news period. (Balbi, Calif.) Asks for reports to *Radio Sofia*, Foreign Language Service, Sofia, Bulgaria. (Bellington, N.Y.) *Radio Sweden* reports the new transmitter on 9.700 in Turkish 1100; on 6.070 at 0000 in Bulgarian.

**Canary Islands**—EA8AB, *Radio Clube Tenerife*, approximately 7.515, heard 1650; clock chimes hour and call is given 1700; noted another day signing on 1610. (Pearce, England)

**Cape Verde Islands**—CR4AA still noted near 5.928 at 1645; signs off 1800 with "A Portuguesa." (Pearce, England) In recent view, listed schedule as 1530-1700. (Ferguson, N.C.)

**Ceylon**—The Commercial Service of *Radio Ceylon* now is relaying "Voice of America" programs in Urdu and Hindi 0730-0830 and programs in *English* for South Asia 1030-1100 on 7.190, 11.975. (WRH Bulletin) Confirmed by Pearce, England, who has heard these broadcasts; mentioned a 16-m. outlet as parallel (probably 17.730 or 17.770).

**Chile**—CE1180, 11.998, noted at fair level 1930 with news in Spanish. (Dyrekto, Brazil) CE1515, 15.15, Santiago, noted with fair level but occasional

fading 2000. (Gay, Calif.) *Radio Emisora Nuevo Mundo*, 11.74, Santiago, heard with news in Spanish, excellent level, around 2000-2100. (Hoogerheide, Wisc.)

**China**—*Radio Peking* has *English* broadcasts now 0430-0500, 0835-0900, 1700-1730 on one or more of these channels—15.060V, 11.685 (announced 11.690), 10.260, 6.100 (and possibly 15.170). (Morales, La.; others) The 0835 news normally is not carried over 6.100, 10.260. (Dilg, Calif.)

Here is late data from Dilg, Calif., on Communist Chinese outlets—6.100, Peking, scheduled to 1100, good level; 6.320V, heard 0630 to after 0900, good level; 6.390, Sian?, heard 0630 to after 0900, fairly good; 6.420A, possibly Hankow, heard around 0800, fair; 7.100, Harbin (Manchuria), audible to 0630 and later, weak; 7.145, Kunming?, weak, usually "smothered" by Taiwan, heard around 0900; 7.500, North Shansi?, heard around 0700-0900, fair; 7.670A, may be Mukden (Manchuria), heard around 0700-0930, fair; 10.260, Peking, does not carry *English* 0835 but usually does at 0430, signal better than 11.685 or 15.060; 11.685, Peking, *English* 0835, announces frequency as 11.690, on West Coast signal on 11.685 usually is better than on 15.060 which parallels; 15.060, Peking, carries *English* 0830, signal erratic at present.

**Cuba**—COBZ, 9.030, sent QSL card from P.O. Box 866, Havana, Cuba. (Kroll, N.Y.) Regarding a report in the May issue of *Short Wave News*, London, about a station testing as "CML, The Voice of Cuba," on 7.911, Sklenar, Havana, writes: "Haven't heard a station with that announcement, but one of CMQ's outlets does operate on about that channel and announces as 'C-M-Q (say-emmy-koo) desde Radio Centro, La Habana.'"

**Czechoslovakia**—Prague noted with *English* 1600 on 11.875 (best) and 9.55. (Bellington, N.Y., others) And with *English* 1930-2000 on 9.550 (Young, Ky.; Patterson, Ga.) Also noted parallel on 11.875. (Chatfield, N.Y.; Stauhs, N.J.) Noted closing *English* session 1430 on 11.840, fair level, some QRM. (Fargo, Ga.)

**Denmark**—Due to adverse atmospheric conditions, Copenhagen has revised its North American schedule; broadcasts now are only 45 minutes in length (first 30 minutes Danish, last 15 minutes *English*); is scheduled 1630-1715, 15.32; 2030-2115, 2145-2230, 9.52. Station officials state—"It is our hope that this new schedule will facilitate the reception of the Danish broadcasts, and here at Radio House we shall be very grateful for all kinds of comments and suggestions as to the reception of our programs." (Wadhams, Calif.) Copenhagen's weekly DX session normally is on Tuesday evenings (EST), but on occasions has special program then, in which case the DX program is deferred to Wednesday. (Bellington, N.Y.)

**Egypt**—SUX, 7.867, Cairo, heard with Arabic musical program from



1450 to closedown 1630 after Arabic news. (McWalter, Scotland)

**France—English** programs (presumably for Europe and British Isles—KRB) are scheduled from Paris this summer 0300-0315, 6.145, 7.240; 1345-1400, 1500-1600, 6.200, 7.280. (Catch, England) Paris, 17.85, has news in French 1215 sign-on to 1230. (Cox, Dela.) Noted with *English* on 6.200 at 1500; and signing off in French with "La Marseillaise" 1030 on 15.39.

Pearce, England, believes the station on 9.755 with Arabic news 1515 and with call "Hunas Francesa" at 1530 is Paris. Do not confuse with *Radio Omdurman*, 9.746A, Anglo-Egyptian Sudan, whose last Arabic broadcast is heard by Pearce, others, 1400-1430 sign-off.—KRB

**Germany**—Noted Hamburg, 7.29, in dual Osterloog, 11.795, recently with Swiss or Bavarian-type music 2335; 7.29 was best signal, but "sounds" like is using more than 400 watts (listed) on the 11.795 outlet; verification received for Osterloog channel. (Bellington, N.Y.) Latter noted in Texas by Stark after 2300.

By this time, *RIAS* (U.S. Sector of Berlin) should have a new transmitter in operation—in either the 42- or 41-m. band; schedule should be 2200-2005 daily. (ISWC, London)

**Greece**—Still noted on 11.717A at 2000 to North America with news in Greek; news in *English* varies at around 2035 to 2040. (Fargo, Ga., others)

Pearce, England, has noted a Greek station on approximately 8.010 with recordings to 1630 closedown. He notes that Larissa, 6.745, does not have *English* some Thursdays as scheduled (1530-1540).

**Greenland**—Gronlands Radio, Godthaab, verified recently with attractive QSL card. (Bellington, N.Y.; Oskay, N.J., others)

(Continued on page 119)

## GUILD EMBLEMS

**THE** Radio and Television Technicians Guild of Florida, Inc. is currently issuing a distinctive emblem (Fig. 1.) to its members and conducting an intensive advertising campaign to familiarize customers with the symbol.

Co-op advertising is appearing regularly in the local papers with a facsimile of the emblem and a list of local technicians who are affiliated with the Guild.

Officers of the organization include: Bob Collins, president; Orville Smith, vice-president; A. Edward Stevens, treasurer, and Steven J. Petruff, secretary.

Fig. 1.



August, 1951

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### U-V LIGHT SOURCE

8 watt ultra-violet light source. In kit form including Sylvania black-light tube, (for U-V light in the 3660 Angstrom unit region) ballast, starter, mounting panel, reflector, line cord/plug, hardware, instructions. As invaluable device for schools, labs, service shops, home workshop, etc. Here is a genuine value. Complete kit, (less outer housing) . . . only **\$4.95**

### Power Supply for Any 274-N Receiver

A shipment of the special transformers has just been received and this popular power supply is now once again available. Just plug it into the rear of your 274-N RECEIVER . . . any model! Complete kit, and black metal case, with ALL parts and diagrams. Simple and easy to build in a jiffy. Delivers 24 volts plus B voltage. No wiring changes to be made. Designed especially for the 274-N receiver. All necessary parts for conversion of rest of receiver also included. ONLY **\$8.95**. Complete kit, (less outer housing) . . . only **\$4.95**



TUNING KNOB for 274-N Receiver, 59c ea.

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Type TS-10—Brand new, limited quantity . . . . . **\$25.95** pair

### HANDSET HANGER

Beautiful cast aluminum shell finished in black wrinkle. Takes all makes and models. An extremely useful, well-made item. . . . only **\$1.95** ea.

### HS-24 HI-QUALITY HEADSETS

Made by W-E. Often used for BC monitoring. Each receiver same as receiver unit in TS-10. Can also be used as fine dynamic mike. Complete with cord and headband. . . . . only **\$4.95**

### HV VACUUM CAPACITORS

VC-50 — 50 MMF . . . . . **\$ 3.95** ea.  
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274N/ARC-5 Spine tuning knobs. . . . . **.59** ea.  
Same as above except with deluxe tuning crank . . . . . **.89** ea.  
Tuning crank. Fits RU 16-17, BC 433 etc. for manual tuning . . . . . **.89** ea.

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PE-103 plugs. NEW. . . . . **.98c** ea.  
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Power Transf. 350-0-350 @ 70 ma. 5V @ 3A. 6.3 @ 3A. Pri. 110V, 60 cy. AC. Upright mtg. . . . . **\$3.25** ea.

Power transf. Pri. 115V. AC, 60 cy. Sec. 520-0-520 @ 200 ma. . . . . **\$5.25** ea.

Power transf. Pri. 115V, 60 cy. AC. Sec. 310-0-310 at 50 ma. Cased, upright mount. . . . . only **\$1.95** ea.

Output transf. 50L6 to voice coil. . . . . **.79c** ea.

Choke, 6 henry, 200 ma. Strap mtg. . . . . only **\$1.95** ea.

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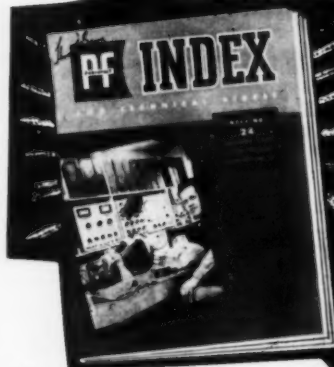
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# Manufacturers' Literature

Readers are asked to write directly to the manufacturer for the literature. By mentioning RADIO & TELEVISION NEWS, the issue and page, and enclosing the proper amount, when indicated, delay will be prevented.

## TAPE RECORDER

Berlant Associates, 4917 W. Jefferson Blvd., Los Angeles 16, California now has available copies of its new bulletin on the "Concertone" magnetic tape recorder.

The new bulletin illustrates and describes the basic recorder, the unit in a carrying case, and the mechanism in a console cabinet. Complete specifications and prices are given. A schematic diagram and the frequency response characteristics of the recorder are also included.

## RIDER CATALOGUE

John F. Rider Publisher, Inc. of 480 Canal Street, New York 13, New York has announced the availability of a new catalogue which is being distributed without charge.

The 8-page catalogue contains a complete up-to-date listing of all the publisher's manuals and textbooks and provides data on the firm's continuous diagram service.

Copies of the catalogue may be secured either from the company's distributors or from the publisher direct.

## "BULPLATE" BULLETIN

Ratings and sizes of standard "Bulplate" flat ceramic condensers are given in the new Engineering Bulletin 602 just issued by Sprague Electric Company of North Adams, Mass.

The units are made in six different physical sizes in single and multiple capacitance combinations with voltage ratings up to 5000 volts. The bulletin explains how one of these ceramic units may combine all the condensers in one or more electronic circuits into a single, integral assembly, thus permitting a saving of chassis space and a reduction in wiring and soldering time on the production line.

## REPLACEMENT GUIDE

The Astatic Corporation of Conneaut, Ohio has just released a new phonograph cartridge directory and replacement guide for service technicians and audio men.

Printed on heavy stock to withstand repeated usage, the directory has a complete listing of cartridge models of all major cartridge manufacturers. Cartridges made by the company's competitors are listed alphabetically and numerically and the recommended Astatic replacement for each is indicated.

The new publication includes illustrations of all Astatic cartridges and needles, together with complete performance data on each. Another sec-

tion carries a listing in tabular form of discontinued Astatic cartridges and the proper current replacements for them.

Available in quantities, the new directory may be secured from the company by specifying Form No. S-168.

## TUBE INVENTORY CONTROL

A new "1951 Tube Movement and Inventory Guide" for the radio service dealer has been announced by the Tube Department of Radio Corporation of America.

The 16-page book, in chart form, is designed as a year-round master control covering more than 400 receiving tubes and kinescopes. Through a simplified record-keeping system, the new guide provides the dealer with at-a-glance control of his electron tube stocks and enables him to maintain balanced inventories with a minimum of bookkeeping.

The charts are arranged in double-page spreads to provide tabular space for a full 12-month inventory-order record for every RCA receiving tube and kinescope in the dealer's stock.

This new guide is currently available from RCA tube and parts distributors.

## POCKET TV TUBE GUIDE

Sylvania Electric Products Inc. has announced a new vest pocket TV Tube Selector listing more than 100 TV picture tube types; and indexing them as to round or rectangular shape; metal or glass construction; clear, grey, aluminumized or frosted face plates; and the presence or absence of external conductive coating.

This new selector list was prepared especially for the convenience of television technicians and dealers. Copies are available without charge from any authorized Sylvania tube distributor.

## TUBE HANDBOOK

The Tube Division of the General Electric Company has issued a new 107-page pocket-size handbook listing the essential characteristics of every type of receiving tube likely to be found in any home receiver—AM, FM, or television.

Prepared primarily for the service technician, the reference contains ratings and other data essential to fast, efficient troubleshooting. Basing diagrams for each of the 856 different tube types listed are shown on the page with the data.

Included in the new edition of the handbook are the many new receiving tubes recently announced for use in

**RADIO & TELEVISION NEWS**

television applications, a comprehensive coverage of subminiature tubes, and a new section listing the essential physical and electrical characteristics of television picture tubes.

The information presented in the handbook is industry-wide in scope, so the inclusion of the tube in the publication does not necessarily imply the availability of that type from General Electric.

The handbook, which is priced at 35 cents a copy, is available only through General Electric, and Ken-Rad electronic tube distributors.

### "TELETRON" CATALOGUE

The Cathode-Ray Tube Division of Allen B. Du Mont Laboratories, Inc., 750 Bloomfield Avenue, Clifton, New Jersey has recently issued a new 12-page catalogue covering its latest types of picture tubes.

Comprehensive information is given on the various "Teletron" types including complete data on the two new electrostatic-focus types 17FP4 and 20GP4 and the 30 inch type 30BP4.

The publication also provides complete ion trap adjustment directions for all of the company's "Teletrons" and basing details for both their electrostatic-focus and magnetic-focus types.

### ION BURN BOOKLET

A booklet which tells how to prevent screen damage by ion burns is currently available from Sheldon Electric Co., Irvington 11, New Jersey.

Of interest to television service technicians, dealers, jobbers, and set manufacturers, this pamphlet describes the ion trap, how ion burns occur, and what can be done to prevent the trouble. It also specifies the five basic points to be observed when adjusting the ion trap to prevent screen damage by ions.

Copies of this pamphlet, designated Bulletin T-2, are available without charge from the company.

### MASTER INDEX

Supreme Publications, 3727 W. 13th Street, Chicago 23, Illinois is now offering a copy of its "Master Index" which is a complete cross reference to the contents of all ten volumes of the company's "Most-Often-Needed Radio Diagrams" and all five of the television volumes.

Besides serving as an index and guide to technicians who use the company's manuals, the index also contains several pages of explanation on how to use radio diagrams in servicing.

Free copies are available if our readers will make their requests direct to the publisher, enclosing a three-cent stamp to cover postage. Normally the index retails for twenty-five cents.

### RECORDING COMPONENTS

Cinema Engineering Company of 1510 West Verdugo Avenue, Burbank, California has recently issued a new 4-page bulletin "Magnetic Recording Components."

August, 1951

NEW for '51

Automatic  
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1949, 1950 and 1951  
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Spare.....\$5.95

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25.05 MFD	600 VDC	.40
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25.1 MFD	600 VDC	.45
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### BATH TUB

4 MFD	100 VDC	.45
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2X.1 MFD	200 VDC	.40
.1 MFD	200 VDC	.40
2 MFD	400 VDC	.55
.05 MFD	600 VDC	.40
.25 MFD	600 VDC	.40
.1 MFD	600 VDC	.40
.5 MFD	600 VDC	.45
1 MFD	600 VDC	.45
2 MFD	600 VDC	.50
2X1 MFD	600 VDC	.65
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2X.1 MFD	1000 VDC	.60

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1 MFD	500 VDC	.55
1 MFD	500 VDC	.70
1 MFD	600 VDC	.85
2 MFD	600 VDC	1.15
4 MFD	600 VDC	1.55
5 MFD	600 VDC	1.85
1.8 MFD	600 VDC	2.75
3 MFD	600 VDC	2.75
2 MFD	1000 VDC	1.65
3 MFD	1000 VDC	2.00
.25 MFD	3000 VDC	2.85
.5 MFD	3000 VDC	2.85
1 MFD	7500 VDC	12.00
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### PARAFIL

8-8 MFD	600 VDC	\$2.25
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8-8-4 MFD	650 VDC	\$2.45
100-100 MFD	50 VDC	1.50

### ELECTROLYTICS

2500 MFD	3 VDC	.40
500 MFD	12 VDC	.35
25 MFD	25 VDC	.40
50 MFD	25 VDC	.60
1000 MFD	25 VDC	1.25
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### TIME DELAY SWITCHES

1 Minute 115 VAC 60 Cy. Encl.	
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3 Micro Switches Metal Contact at 40-41-42 Sec. Time Delay 110 VAC Motor. New.....	4.50
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30-40 Second Mercury Time Delay Relay 110 VAC AD-lake. New.....	7.50

### TRANSFORMERS

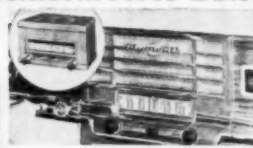
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2X3/879.....	.90	2051.....	1.15
3C24.....	1.85	7193.....	.50
7C4/1203A.....	.85	8011.....	2.40
10Y.....	.45	9006.....	.50
15L.....	.85	CSB.....	.75
39-44.....	.85	CS72.....	1.40
45 Spec.....	.35	CK-70.....	.425
205A.....	8.80	1A4.....	1.40
310A.....	.75	E1148.....	.30
3X31.....	2.50	HY-612.....	.40
702B.....	.85	HK-73.....	.75
713A.....	1.45	HK-73.....	.75
803.....	4.45	VT-98.....	21.00
801A.....	.95	3BP4.....	3.45
931A.....	5.50	3BP4.....	3.95
864.....	.45	5FP7.....	1.95
600B.....	29.95	3A4.....	.60
CK1005.....	.85	126G.....	.95
CK1007.....	.85	5000 VDC.....	1.20
33.....	.65	68G7.....	1.95
1626.....	.95	68J7.....	1.45

### TRANSMITTING MICA

.005 MFD	1800 VDC	\$ 0.85
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.006 MFD	2500 VDC	1.15
.00025 MFD	2500 VDC	2.50
.00075 MFD	5000 VDC	2.75
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.0002 MFD	6000 VDC	9.50
.0012 MFD	20,000 VDC	32.50

### Ceramic Rotary Switches

Pole	Position	Section	Shaft	Price
1	3	6	1"	\$0.60
2	3	6	1"	.85
3	8	2	2 1/8"	.85
4	10	2	2 1/8"	.85
4	12	2	4"	.75
2	8	2	3/4" 30A 30VA	2.50

2 Pole 2 Circuit 6 Cont. W Knob.....\$1.50

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12 VDC DPST Allied Control Box 2-32.....	\$1.25
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De-Ion Line Starter DPST 115V 60 Cy 15A West. New.....	\$6.95
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### ROUND PANEL METERS

LEADING BRANDS

0-5 RF Amps—Westing	3 1/2"	\$4.50
0-300 MA DC—Simpson	2 1/2"	3.75
0-100 Amps DC—Hoyt	3"	5.00
0-3 Volts DC—Ses	2 1/4"	3.50
0-15 Volts AC—GE	3 1/2"	4.95
0-2500 Volts DC—Simpson	3 1/2"	5.95
With Multiplier		
0-50V DC 0-10 MA DC	3 1/2"	5.95
0-150 Volts AC—Hoyt	3 1/2"	4.50

PORTABLE METERS

0-10 Amps DC—Weston	485	8.50
0-3-6-30 Volts DC—Weston	280	19.95
0-100 Amp DC—Weston		
with 100 Amp—Shunt	260	27.95
0-25 Amps AC—Weston	433	37.50
0-1-5-4 Volts AC Output-meter—Weston	571	14.95

### CARRY-ALL

TV AND RADIO SERVICE CASE  
\$12.50

### LINEAR POTENTIOMETERS WW

Ohms	Watts	Ex.	Ten
200	2	\$0.45	\$0.40
1000	2	.50	.45
3000	2	.55	.50
5000	2	.65	.50
10,000	3	.50	.45
7500 Dual	3	.85	.80
10,000	3	.55	.50
25,000	3	.65	.60
50,000	4	.90	.85
15	25	.95	.90
25	25	.95	.90
50	25	.95	.90
100	25	.95	.90
Output 250V @ 70MA		2.65	2.50
500	25	1.20	1.10
1000	25	1.30	1.25
3000	25	1.40	1.35
15,000	25	1.70	1.60
20,000	25	2.00	1.95
150/5 Switch	50	2.15	2.00
200/W Switch	50	2.15	2.00
600	50	2.65	2.50
10,000	50	2.95	2.75
15	60	2.95	2.75
18	75	2.95	2.75
750	150	1.95	1.85
20,000	5	9.50	
20,000	5	4.33AC	8.50
5000		1.95	
6000		2.25	

### POWER EQUIPMENT

Voltage Regulator Raytheon 95/130 V 60 Cy 1.25 Amp Output 115V 60 Watt. New.....	\$12.50
Generator Voltage Regulator 115V 400 Cy GE GBA-20C. New.....	19.95
Vibrapak VPC 300 12 VDC Output 250V @ 70MA Synchronous Mallory. New.....	8.95
ATH Inverter and Regulator 110VDC to 110 VAC 50/60 Cy 150 Watt Model RSB. New.....	24.95
VIBRATOR AT-2410 24 VDC Output 110V 100W. New.....	2.50

### SPECIALS

80-86 KC Crystal with Holder.....	\$2.90
CD-501A Cord Connects BC-654 Transceiver to GN-45 Gen.....	1.95
Balloon with Hirschman Gen.....	2.50
Gibson Girl Box Kite.....	2.25
33-440 Mmf Variable Condenser.....	1.10
7-100 Mmf Variable Condenser.....	.95
2-750 Mmf Tapered Rotor.....	
Plates.....	1.25
American Hiwatt 115V 1 Phase 60 Cy 1725 RPM.....	24.95

COMET ELECTRONIC  
SALES CO.

22 Washington St. • BEacon 2-7863 • Brighton 35, Mass.



# How To Prepare for COLOR TELEVISION

By

**Milton S. Kiver**

Television Consultant,  
Radio & Television News



## CAN YOU AFFORD TO WAIT?

The recent Supreme Court decision, in favor of the C.B.S. Color TV System shows that **color television is here!** Trained technicians capable of servicing the complex black-and-white sets and the even more complex color television circuits will be the ones who will command respectable positions and high salaries as Color TV grows in importance.

The radioman of today who recognizes this growing demand for trained television servicemen . . . who acts by preparing himself now with the proper training and information . . . is the man who is insuring his future. You just cannot afford to waste time!

## PROPER TRAINING: A KEY TO SUCCESS

Every practical man knows that to learn TV servicing the right way, you have to do actual TV servicing. You have to know how to locate troubles quickly . . . repair them efficiently. Some men are fortunate enough to be able to attend school. A good many others cannot leave their jobs and so must get whatever they can at home. Fortunately, there is a training program available that teaches you television servicing in a practical, learn-by-doing way.

It's a home study program in which you learn up-to-date practical, professional television servicing in your spare time—without leaving your present job. Included in this course is information on testing, trouble-shooting, repairing and servicing of all types of TV sets plus set conversion, master antenna installation, printed circuits and many field servicing short cuts. In addition, a complete section on Color TV is also included. As developments take place in Color TV, this section will be expanded accordingly, to give you all the latest facts.

## PRACTICAL EXPERIENCE IS ESSENTIAL

To give you the experience you need, you build and service a modern large screen television receiver which is furnished as part of the course and which is yours to keep. As an *optional* feature, you can get two weeks of actual field experience going out on service jobs and working on the repair bench for Chicago's largest independent television servicing organization. So practical is this course that after the first few lessons you can start earning money doing actual television servicing!

You can get complete information on this practical television servicing course as well as sample lessons. Just write **Television Communications Institute, 205 W. Wacker Dr., Dept. 1-M, Chicago 6, Ill.**

Included in the listing of components are the company's RE-2 recording head, the PB-10 playback head, the ER-1 erasing head, a tape and film degausser, and a magnetic erasing pencil.

Copies of this bulletin are available from the company on request.

## TAPES FOR TV

Technical data on electrical tapes used in the construction of television equipment has been assembled into a new 8-page booklet which is currently available from the **Minnesota Mining and Manufacturing Co., 900 Fauquier Street, St. Paul 6, Minn.**

The new "Tapes for Television" booklet provides information on production uses for tapes and gives technical data on seven electrical tapes and one filament tape. Ten different designs and one installation-maintenance problem and their solutions are pictured and described.

Included are uses showing deflection yokes, focus coils, flyback coils, electrolytic condensers, and antennas being constructed and serviced.

## CRYSTAL CATALOGUE

**James Knights Company, Sandwich, Illinois** has released a new and comprehensive catalogue covering its full line of modern stabilized crystals for all types of electronic applications.

Designated the Crystal Catalogue #51, the new publication includes dimension drawings and general specifications on the company's crystals and holder types, old replacement types as well as the new. The data is presented in easy-to-use form for quick reference.

## BUSINESS FORMS

**Oelrich Publications** of 4135 N. Lawler Avenue, Chicago 41, Illinois has published a data sheet listing all of the business forms that the company has developed specifically for the radio and television service industry.

One of the newest forms listed is the "Television Service Report," a tripartite form which provides space for entering complete service data on both television sets and antenna installations. Other forms listed include service contracts, television job tickets, radio service records, the company's standard rate book, a radio work sheet, and a television service call book.

## COAX DATA

**Andrew Corporation** of 363 East 75th Street, Chicago 19, Illinois has just issued a comprehensive catalogue entitled "Coaxial Transmission Lines" which is a compilation of many of the company's individual bulletins.

There are ten sections to the catalogue, dealing with semi-flexible coaxial cables, rigid transmission lines, gassing equipment, FM and TV broadcast antennas, communications antennas, microwave antennas, antenna tuning equipment, instruments and components, tower lighting equipment, and a price list.

—50—

for music lovers only



Your records (LP's or Standard) need not produce fuzzy, noisy, distorted music. In their sound grooves is fine musical realism of concert hall quality that can be recreated by record players if equipped with fine audio components: pickup, arm, compensator, preamplifier, etc. Such components by **Pickering** are the finest available; the choice of engineers, leading record critics, music lovers and specialists in the production of custom record playing systems.



Pickering High Fidelity Components are available through leading jobbers and distributors everywhere; detailed literature will be sent upon request.



**PICKERING & CO., Inc.**  
Oceanside, L. I., N. Y.

Address Department C

"BEST BUY OF THE MONTH" . . . NEW "JUMBO RADIO PARTS KIT" . . . 17 POUNDS OF COILS, RESISTORS, CONDENSERS, WIRES, SOCKETS, ETC. . . . \$3.95

**METAL GRILLE** . . . gilt, diamond (1 1/2 x 2 1/2) . . . \$1.35; 12 x 12—\$8.95; 12 x 18—\$1.35; 18 x 18—\$1.95; 18 x 24—\$2.95; 24 x 24 . . . \$3.49

**PORTABLE RECORD PLAYER CASE** . . . leatherette, wood, inside: 17 1/2 x 14 x 5 1/2 . . . \$4.95

**HS-30E HEADSET Y-CORD & CLIP** . . . \$1.00; **HS-30 HEADBANDS** . . . \$1.00; **HS-1 HEADBANDS** . . . \$1.00; **ALUMINUM PANELS** . . . \$1.49

**MASONITE PANELS** . . . \$1.49; **LUMINOUS TAPE** . . . \$2.49; **ALL-PURPOSE RADIO CEMENT** . . . \$1.55; **CEMENT THINNER-SOLVENT** . . . \$1.39

**ALNICO BAR MAGNET** . . . \$1.00; **ALNICO MAGNET KIT** . . . \$1.00; **powerful Bar Block** . . . \$1.00; **Ring, "U," etc.** . . . \$1.00

**Kit of 10 asstd. parts** . . . \$1.00 (Write for "Alnico Magnet" Supplement)

**LORENZETTE EARPHONE** . . . ext. handle, 4 ft. cord, 50 ohms . . . \$2.49

**LINEAR SAWTOOTH POTENTIOMETER (WE-851318)** . . . \$3.95

**SC-608 INTERPHONE CONTROL BOX** . . . \$1.00; **SC-1266 JACK BOX** . . . \$1.00; **GENERATOR VOLTAGE REGULATOR (GE)** . . . \$1.00

**NAVY 2 GIP-1A-18.24 cont. relay** . . . \$1.00; **SOW. RHEOSTATS** . . . \$1.20; **PILOT BULBS** . . . \$1.30

**RESISTOR LINE CORDS** . . . \$1.30; **GUN SYNC CONTROL BOX (Fairchild Mk3)** . . . \$1.30

**"Gold Mine" of Toggles, Relays, Fuses & Posts, connectors, etc. NEW** . . . \$2.95

**BARGAIN KITS** . . . \$1.00; **KNOBBS** . . . \$1.00; **SHOULDER BAKELITE CONDENSERS** . . . \$1.00

**12 1/2" FT. WHIP** . . . \$1.79; **HIGH FIDELITY CRYSTAL MIKE** . . . \$1.29

**ALUMINUM HOUSING for crystal mike** . . . \$1.15; **RADIO HARDWARE TREASURE** . . . \$1.95

**GT TUBE CARTONS** . . . \$1.00; **5V. HI-FREQUENCY BUZZER** . . . \$1.00

**AUTO SUPPRESSORS** . . . \$1.00; **18 ft.—\$2.49; 12 1/2 ft.—\$1.79; 9 1/2 ft.—\$1.49**

**"QUACKER" INPUT (1 1/2 x 7 1/8)** . . . \$1.00; **VARIABLE CONDENSERS** . . . \$1.00

**"FACTORY SPEAKER REPAIRS SINCE 1927"** . . . \$1.00; **Min. order \$3.00, 20% deposit req. on all C.O.D.'s.**

**LEOTONE RADIO CO.**  
87 Bay Street  
New York 7, N. Y.

**RADIO & TELEVISION NEWS**

## 300-B Amplifier (Continued from page 53)

frequency stability when only two coupling circuits are employed (the coupling to the two sides of a push-pull stage is considered as one such circuit). This amplifier has four circuits, but one is included within the feedback driver, so that its phase shift is minimized over a wide range, and the other time constants are very long. It would be possible to eliminate the coupling circuit in the feedback loop, going to the off grid of the first tube, by returning the cathodes to a negative point and returning the grids to ground. This was not found necessary with this particular amplifier, but it might be if a different output transformer were used.

High frequency stability is similarly a function of the output transformer, but this time the phase shift in the amplifier is due to the stray capacitance which is present in each stage. Again, for a given transformer, it is desirable to keep the phase response of the amplifier flat to as high a frequency as possible.

At the high frequency end, however, there will be a slight resonance effect in the best transformers. This may not be enough to be detectable in a frequency response curve, but there is a phase variation which will result in ringing if it is not compensated. With any but the finest transformers, this effect will result in excessive ring or even in uncontrolled oscillation.

In this amplifier the trimmer condenser (C<sub>2</sub>) in the feedback loop is adjusted to give minimum ring (the slight oscillation at the start of the high frequency square wave). The amount of ring shown in the square wave photographs is permissible, but not desirable.

The square wave photographs will serve as a basis for comparison with other amplifier designs. Significantly greater ring may be considered evidence of a poor output transformer, improper amplifier design, or possibly both.

Despite all this the amplifier sounds good. The total harmonic distortion at 30 watts is approximately .3 percent, and the damping factor is on the order of 30.

There are a number of respects in which this amplifier can be improved; the unit described is, after all, only an experimental one. The principle of the self-balancing feedback driver, however, is one which may be profitably adapted to any design where large amounts of drive voltage are desired at low distortion, without the phase and frequency discrimination inherent in the finest input transformer.

The author wishes to acknowledge the assistance of Kenneth Wisner, who assembled the amplifier, and Jan Syjala, who prepared the various photographs.

-30-

## OFFICIAL MILITARY 35mm SLIDES



RUSSIAN T-34 TANK

AVAILABLE NOW AT  
SENSATIONAL LOW COST!  
• Authentic Army Air Force  
recognition 35 mm. slides of  
military equipment of all na-  
tions. Gov't. surplus, brand  
new & W. W. surplus, each heavy  
4-ply mounted, numbered,  
and fully identified. Terrific bar-  
gain at only 5c each, available  
in sets of 50 slides in any of  
1. NAVAL SHIPS 2. MERCHANT  
SHIPS, 3. ARMORED VEHICLES. When ordering, please  
specify which classification is desired. Set of 50 SLIDES,  
U.S.A. .... \$3.00

### AMPLIFIERS:

BC-605 AMPLIFIER—Ideal for conversion to Inter-  
comm. set. Includes two 1619 Tubes, input and out-  
put Transformers, Volume Control, Jacks, Switch, and  
Schematic. Prices: NEW: \$6.95 USED: \$3.95

BC-347 AMPLIFIER—Aircraft Type, contains 2 Midget  
17C Outboard Transformers, complete with 6F8 Tube,  
NEW: \$2.95

### DYNAMOTORS:

INPUT:	OUTPUT:	STOCK NO.	PRICE
9 V. DC	450 V. 60 MA.	DM-450	
6 @ 6 V. DC	275 V. 50 MA.	w/Blower	\$3.95
12 V. DC	220 V. 70 MA.	DM-24	6.95
12 V. DC	220 V. 100 MA.	DM-18	4.95
12 or 24 V. DC	440 V. 200 MA. &		
	220 V. 100 MA.	D-104	9.95
12 V. DC	600 V. 300 MA.	BD-86	7.95

PERMANENT MAGNET FIELD DYNAMOTORS:  
12 or 24 V. DC 275 V. 110 MA. USA/0516 \$3.95  
12 or 24 V. DC 500 V. 50 MA. USA/0515 2.95  
6 @ 6 V. DC 240 V. 50 MA.

Tell Us Your Dynamotor, Inverter, & Motor Needs!

## WHIP ANTENNA EQUIPMENT

### MAST BASES—INSULATED:

MP-48 Base (Illustrated at right) Insulated type with heavy coil spring. Requires 1 1/2" mounting hole. Weight: 11 lbs. Price.....	\$4.95
MP-132 Base (Illustrated at left) 1" heavy coil spring. 2" insulator. Overall length: 11 1/2". Weight: 2 1/2 lbs. Price.....	\$3.95
MP-22 Base—Spring action direction of bracket. 4" x 6" mounting. Price.....	\$2.95

### MAST SECTIONS FOR ABOVE BASES:

Tubular steel, copper coated, painted, in 2 foot sections, screw-in type. MS-53 can be used to make any length, with MS-52 51-50-49 for taper. Price, each, for any section.....

WHIP ANTENNA—9 1/2' FL rigid mount. Uses three screw-in sections: MS-49-50-51 and rigid 50c section w/ antenna connection.....

### BC-223 TRANSMITTER

20 Watt Transmitter with Crystal or MO control on four pre-selected channels. CW, MCW cover frequency range 2000-5200 KC by use of plug-in coils. Complete with tubes and choice of one Tuning Unit (listed below). Less Mfg. Prices: NEW: \$52.50. USED (Gov't Reconditioned).....

\$26.50

### CABLE—Trans. to Power Supply.....

TUNING UNITS: TU-17—2000-3000 KC. TU-18—3000-4500 KC. TU-25—5000-5250 KC. \$3.50 EACH

SPARE TUBE KIT in metal box, f/BC-223.....

PE-125 POWER SUPPLY f/BC-223—12/24 Volt input; output 500 Volt 150 MA. ....NEW: \$14.95

SPARE VIBRATOR & TUBE KIT f/PE-125.....\$5.95

SHOCK MOUNTING for PE-125.....\$1.50

FT-173 MOUNTING for BC-223.....2.50

BC-223 TRANSMITTER—Incomplete, for parts. No front panel or meters. Price—As Is.....\$4.95

### 3/4 RPM ANTENNA ROTATOR MOTOR

High torque, reversible motor—operates directly from 110 Volt 60 cycle by use of condenser. Light weight, quiet running, ruggedly built, positive stop, easily mounted. Normally operates from 110 Volt 400 cycle. Complete—with instructions. NEW.....

\$4.95

10 MFD 400 Volt Cond., \$1.00. SPDT Switch: 35c

### RA-10 RECEIVER

(Mobile, Boat, Aircraft)

8 Tube Bendix Set, freq. range 150-1100 KC & 2000-10000 KC in 4 bands by use of remote control unit. Size: 18 1/2" x 10 1/2" x 8 1/2". Wt. 3 1/2 lbs. Complete with remote control unit, dyn., and plugs. Available for either 14 or 28 VDC operation. Specify which is desired. Price, NEW.....

\$49.95

Address Dept. RN • Minimum Order \$2.00 • Prices F.O.B., Lima • 25% Deposit on C.O.D. Orders

# FAIR RADIO SALES

132 SOUTH MAIN ST.  
LIMA, OHIO

## BLOWERS:

115 Volt 60 cycle BLOWER (pictured), approx. 100 CFM Dis. 2 1/4" Intake; 2" outlet. Quiet running. Motor size: 2 1/4" x 3 1/4". NEW—not Gov't surplus. Order No. RN-520.....

\$7.99

DUAL BLOWER—Same as RN-520 above, except has blower assembly on each side of motor. Order No. RN-800.....

\$12.95

TDQ TRANSMITTER—45 Watts, 115 to 155 MC Crystal Control, Phone, MCW, & CW. Complete with Tubes, 110/220 Volt 60 cycle Power Supply. Excellent condition .....

\$450.00

MP-28BA MODULATOR & DYNAMOTOR POWER SUPPLY—for TA-12 Transmitter. Operates from 35 to 25 VDC. Complete with Tubes. NEW.....

\$29.50

DYNAMOTOR only for TA-12 .....

\$9.95

## 2 FOR 1 SPECIAL

### A-220 MC. CONVERTER FROM THE SURPLUS R-1/ARR-1 RECEIVER

Ideal compact unit for conversion to the 1 1/2 meter band. Uses four 654 Acorn tubes. Size: 3 1/2" x 3 1/2" x 10". For complete conversion instructions, see Radio News, Jan., 1949—AND—

### BC-230 TRANSMITTER

w/ 0-1.5 RF Ampmeter, less tubes. BOTH .....

\$6.95

## 6-VOLT POWER SUPPLY

VIBRATOR TYPE—6 Volt DC input; output 250 Volt DC 50 MA. filtered w/tube. Size: 6 1/2" x 4 1/2" Price .....

\$6.95

VIBRATOR TYPE—6 Volt DC input; output 250 Volt DC 50 MA., not filtered—w/tube. Ideal for Command Receiver operation as receiver is filtered internally. Size: 4 1/2" x 4 1/2" x 3 1/2" .....

\$4.95

## GEAR HEAD MOTOR



Geared 324-1. Approx. 12 RPM Left angle drive. 27 Volt DC input 4050 RPM. Motor Size: 5" x 3 1/2". Shaft Size: 5/8" x 5/8". Price.....

\$8.95

## GEAR TRAIN MOTOR

Ball-bearing, low inertia reversible type motor, 588 RPM. Low speed gear 14 RPM. Extra large gear 5 RPM. Operates 28 Volt 400 cycle or 12 V. 60 cycle. Price.....

\$2.95

## COMMAND TRANSMITTERS AND RECEIVERS

BC-455 Receiver—6 to 9.1 MC.....	USED: \$7.95
BC-457 Transmitter—4 to 5.3 MC.....	5.95
BC-458 Transmitter—5.3 to 7 MC.....	5.95

## AERIAL WIRE:

Aerial Wire—Phosphorous Bronze #16 Stranded, 200 lb. test. Weatherproof. 150 feet on Reel. RL-3 with Clips .....

\$1.50

## GUY CABLE

Regular Aircraft Control Cable, 1/8"—7x7—40 Strands galvanized weatherproof, 920 lb. Test. Ideal for television or radio mast guying. Prices:

2 1/2¢ per Ft.—1000 Ft. or more: 2 1/2¢ per Ft. CONTROL CABLE, 4 wire flat.....

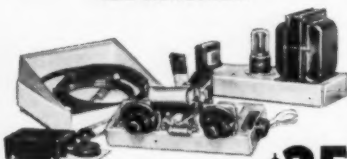
8 1/2¢ per Ft.

## MISCELLANEOUS:

FL-8 Filter, 1020 cycle Audio Filter. Used.....	\$1.50
H16/U Headset w/Cord and Plug. Used.....	1.50
Leg & Seat Assembly for Hand Generators.....	3.50
CD-504 Cord for GN-45 Generator.....	2.00
MR-9C Control Box f/RA-10 Rec. w/Plug.....	
NEW: \$12.50 USED: 6.75	
C-87/ART-13 Control Box f/ART-13 Trans. ....	
NEW: \$6.95 USED: 4.95	
CD-318 Cord f/Throat or Lip Mikes.....	.59
CD-207 Cords 65" w/PL-55 & JK-28.....	.99
CD-504 Cord w/C-410 Trans. & PL-54 Plug.....	.89
CD-365 Cord f/LP-21 Loop.....	1.50
PL-112 Plug f/LP-21 Loop.....	1.00
PL-118 Plug f/I-81 or I-82 Indicator.....	1.00
PL-122 Plug f/ARN-7 Receiver.....	1.50
TS-13 Handset—Used—Tested.....	6.95
HS-30 Headset.....NEW: \$1.95 USED: 1.00	
Head & Chest Set w/Plug for EE-8.....USED: 2.95	
Microphone & Headset, Dynamic type f/MARK II.....	
NEW: \$2.95 USED: 1.95	

## New Novice Class XMTR KITS

80M CW OSC & Power Supply All  
Parts, Chassis, Xtal, Key Antenna,  
and Instructions



Complete—Nothing Else to Buy  
—ALL FOR ONLY— **\$25**

### CRYSTALS FOR S.S.B. EXCITER

Also many other uses—in FT 241-A Holder—1/2" Pin SPC. Marked in 54th OR 72nd Harmonic MC Freq. Listed Below by Fundamental Frequency. Fractions Omitted. Lo Freq.

412 433 472 492	390 401	372 381	450 530
413 434	493 391 402	374 383	452 531
414 435 474 496	392 403	375 384	453
415 436 477 497	393 404	376 386	465 537
416 438 479 503	394 405	377 387	526 538
418 440 481 504	395 408	379 388	
419 441 483 506	396 409	380	
420 442 484 507	400 411		
422 443 485 509			
423	511		
424 446 488 516			
425 447 490 518			
426 448 491 519			
427 462	EACH		
429 468	<b>49c</b>	<b>79c</b>	<b>69c ea. 3 for \$2</b>

### HAM CRYSTALS

4190 6873 7840	3735 5850 6406 6705 7506
5030 6906 7873	5305 5873 6740 7540
5485 6973	5677 6875 6440 6806 7573
6006 7740 7973	5706 6450 7640
6040 7773 8273	5740 5906 6473 7340 7673
6073 7806 8306	5750 6475 7706
6106	5760 5940 6506 7806
6140	6773 5973 6540 7440 8340
6173	6573 7473
6206	5806 6273 6606
6773	5825 6640
	5840 6373 6673
	<b>99c EACH</b>
	<b>10 for \$9.00</b>

### SCR-522 XTALS

5910 7480
6370 7580
6450 7810
6470
6407.9
6522.9
6547.9

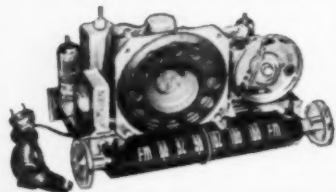
Enclose 20c for Postage and Handling

### BC-610 XTALS

2045 2220 2360 2557 3520
2105 2258 2390 3202 3550
2125 2260 2415 3215 3570
2145 2282 2435 3237 3580
2155 2300 2442 3250 3945
2305 2532 3322 3955
2320 2545 3510 3955

## SPECIAL PURCHASE

Reg. \$29.95 FM Radio  
Chassis-88-108 MC



Complete with 6 tubes, built-in antenna and speaker. Product of famous radio & TV manufacturer whose name we promised not to mention.

**TUBE LINEUP:**  
1-12BA7, 2-12BA6, 1-12SR, 1-35W4, 1-35B5  
May also be used as an FM  
tuner by picking signal off de-  
tector.  
Brand New—Now only. **\$16<sup>95</sup>**

**TERMS:** All items F. O. B., Washington, D. C.  
All orders \$30.00 or less, cash with  
order. Above \$30.00, 25 per cent with order,  
balance C. O. D. Foreign orders cash with orders,  
plus exchange rate.

**SUN RADIO**  
OF WASHINGTON, D. C.  
938 F STREET N W WASH D C

## Signal Substitution

(Continued from page 63)

cal signals may be obtained from the integrating network at the output of the last sync amplifier. The horizontal sync signal at the output sync amplifier is also used. It must be understood that these synchronizing signals are of a relatively high value. To adapt them for use as substitute signals at the sync preamplifier where a weaker signal is required, it is necessary to use some attenuation. A simple voltage divider and variable output load may be used, and the load adjusted for the correct signal as measured with the calibrated scope.

At  $J_1$  the vertical saw-tooth used to feed the grid of the vertical output tube may be obtained. To adjust the amplitude of the signal to the correct height, the receiver height and vertical linearity controls may be used.

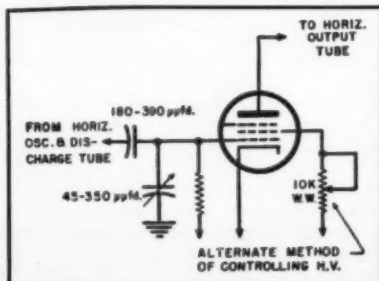
At  $J_2$  the horizontal saw-tooth used to feed the grid of the horizontal output tube may be obtained. To control the amplitude of the signal, the horizontal drive trimmer may be adjusted. However, if the receiver does not have a drive trimmer, one may easily be added. See Fig. 5.

$J_3$  is the jack used to supply the high voltage to the picture tube. If the test receiver used has a horizontal drive trimmer, the amount of high voltage available at  $J_3$  may be controlled by varying the drive trimmer. Another way of controlling the high voltage is to add a variable resistor, 10,000 ohm wirewound, in the screen circuit of the horizontal output tube. See Fig. 5.

The output from  $S_1$ , the horizontal and vertical deflection output, and  $S_2$ , the CRT (picture tube) output may be used to test picture tubes and deflection yoke assemblies. If, for example, a case occurs where there is some sweep distortion, the cause of the trouble may be traced quite easily to either the deflection circuits in the receiver under test, or the deflection yoke.

The input to the audio amplifier of the receiver is wired to  $J_4$ . At this point the signal obtained may be used to check audio amplifiers and audio systems in other receivers. By removing the FM detector tube an audio signal may be fed into  $J_4$ , and the audio amplifier in the bench receiver may be

Fig. 5. Circuit diagram shows method for adding horizontal drive trimmer.



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used to check phonograph pickups or sound i.f. systems of other receivers.

To facilitate testing and alignment of front ends, a convenient filament and "B+" voltage supply may be obtained from the bench receiver. This is shown in Fig. 1 as J.

To make a final air check of front ends, the bench receiver tuner may be removed and the leads to the tuner made readily accessible so that the tuner under test may be easily substituted.

A block diagram of a typical television receiver is shown in Fig. 4. The sources of the substitute signals are shown on the diagram, including the various waveforms which can be found at these sources.

## RCA Set Conversion

(Continued from page 44)

to accommodate the new 14" picture tube. This panel was marked with the same template previously used. The four angles and screws which held the 10BP4 in place were removed and the section marked off was sawed out. Four holes, two on the bottom and one on each side near the top, were drilled about 1/4" in from the sawed edge. The four screws were inserted and the four angles mounted. Only the two bottom screws were tightened to hold the picture tube in place.

The chassis, complete with picture tube, was then placed in the cabinet and the front panel was mounted on the cabinet. The picture tube was centered by adjusting and tightening the four mounting angles. It was necessary to remove and replace the front panel a few times in order to center the picture tube properly. Finally, all screws and knobs were replaced and all electrical connections made, which completed the conversion.

As mentioned in connection with the other conversions, while these circuit modifications have been carefully tested, the General Electric Company can assume no responsibility for the application of these suggestions to the conversion of any particular receiver. If such conversions are performed it is possible that the manufacturer's warranty on the set may be invalidated.



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## Mac's Service Shop (Continued from page 59)

and tell me why that did it," the youth demanded of his employer.

"Because when You-Know-Who put the new battery in he did not do a good job," Mac replied softly. "If he had, he would have carefully cleaned off the banana plugs that slip into the battery terminals, spread the springs a little if necessary, and then coated them with vaseline. Had he done that, we wouldn't have this poor connection that is causing the trouble now. Clean up the terminals and put a 'No Charge' ticket on the set."

Barney's face was a little red as he went about this, but he still managed to pipe up: "I still can't understand why a poor battery connection should cause hum. If I had the a.c. plugged in, I'd think the pulsating output of the charger was doing it, but when the line cord is not even plugged in—"

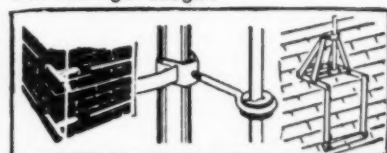
"I'm not sure that I know either," Mac frankly admitted; "but I've got a theory. A storage battery ordinarily has excellent voltage regulation, but a poor terminal contact destroys this ability to deliver a constant voltage under heavy current demands. The closing of the contact points of the vibrator causes regular pulses of current to be drawn from the battery. These pulses of current, in turn, cause dips in the voltage delivered to the filaments of the tubes; and since these fine filaments have very little thermal lag, their emission goes up and down at the vibrator frequency and causes hum."

"An ingenious theory, even if it may be all wet!" Barney applauded. "And speaking of ingenuity, Al, the parts salesman, was telling me a good one when he was here during your vacation. He says one of his customers up in the northern part of the state runs the twin-lead from his tower-mounted TV receiving antenna right into a broadband booster on his showroom floor. The output of this booster is fed into a 'rabbit ears' indoor antenna. When this set-up is in operation, any set within thirty or forty feet of the rabbit ears can pick up a good picture by virtue of the signal re-radiated from the rabbit ears to its own built-in antenna. Sets back in the service department can use this re-radiated signal, too. While the picture is not quite as good as it is when the output of the booster is run directly to the terminals of a single receiver, the system works surprisingly well and saves a whale of a lot of connecting and disconnecting."

"Hm-m-m-m," Mac commented; "that is one for the books! I'd imagine you'd have to keep the receiving antenna and the rabbit ears pretty well separated and the booster gain not too high to avoid feedback trouble; but it certainly has interesting possibilities. Replacing the rabbit ears with a directional type of antenna would give you a chance to check its radiation charac-

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teristics, which is simply its receiving characteristics in reverse. We've got to look into that."

"How was that vacation? Did you get away from service entirely?"

"We-l-l-l, not quite," Mac confessed. "We went to visit my cousin who lives near Orlando, right in the middle of that beautiful lake and orange grove country. My cousin really knocked himself out seeing that we had a good time. Every day we were either yanking the bass, shell-crackers, and bream out of Lake Beau Claire or horsing in the saltwater trout over in Mosquito Lagoon near the Indian River. After we had eaten him out of house and home, worn out his out-board, and chewed about a half-inch off the tread of his tires riding around over those rough-finished Florida black-top roads, we could hardly ignore the fact that none of his radios were working properly. I didn't even try to explain that a technician is pretty severely handicapped trying to work without his instruments. That is something you can't make a layman understand anyway."

"We first tackled the receiver in his station wagon that simply had no punch. Touching the antenna while standing on the ground had practically no effect on the volume; so I diagnosed either an open or shorted antenna connection. My fingers itched for my good old ohmmeter, but since I did not have it, I disconnected the antenna lead from the set and tried touching the antenna connection itself, but this had little result, either. The cover was removed from the set, and it was easy to spot that the lead running from the antenna was shorting to the tuning condenser frame. Clearing this up and touching up the i.f. and r.f. trimmers strictly 'by ear' made the set perform like new."

"The next item was purely a mechanical problem: a broken fabric dial belt. Had I been here, all I should have needed to do was to glance in my JFD belt guide and picked out the exact replacement belt needed; but we had no time to start looking for a belt on this last night before starting home. A length of his heavy surf-casting line was cut off and passed around the pulleys in two complete loops, pulled tight, and tied with a hard knot. Surprisingly enough, it worked to perfection, with the knot passing smoothly over the driver, driven, and idler pulleys."

"The last set really threw me, though. It was a case of an intermittent growling noise that broke in on reception at irregular intervals. It sounded somewhat like the noise produced by a poor connection being shaken by vibrations from the speaker. I removed the set from the cabinet and tapped every tube, condenser, resistor, and solder connection in it without once triggering the noise. Then I thought I had spotted it: the rubber insulation had broken away from an i.f. grid lead and allowed the bare wire to touch the edge of the tube shield. I

SEE LEO FIRST FOR . . .

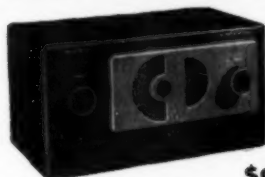
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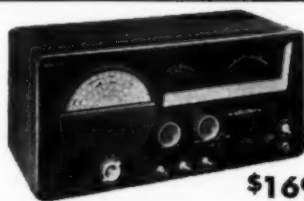
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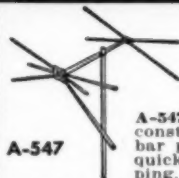
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carefully taped this with *Scotch Tape*, resoldered a couple of suspicious-looking solder joints for good measure, and replaced the set in the cabinet. It played beautifully for about a half hour, and then the same old noise blatted forth for a few seconds, after which the radio started performing perfectly OK again. I was all for yanking it out again, but my cousin wouldn't let me."

"I'm glad!" Barney rejoiced. "You can't imagine how much good it does me to know that there is one set you didn't fix!"

"I hate to spoil your pleasure," Mac said with a slow grin, "but that darned set has been on my mind so much since I came home that I have decided to have my cousin ship it up here and let me work on it where I have something to work with. I've got to know what's ailing it."

"I might have known," Barney said with a sigh of resignation. "I suppose the point of all this is to show what a good job of servicing can be done without the usual equipment."

"You couldn't be 'wronger,'" Mac quickly retorted. "The single impression I got out of the whole experience was a strong reminder that good equipment is absolutely essential for doing fast, efficient, and dependable

service. Not a one of those service jobs was really satisfactory. Aligning them with a broadcast signal is a mighty poor substitute for a signal-generator job of alignment, and I'm confident that fishing-line dial belt will start slipping before long.

"What's more, at least a dozen times I found my hand groping automatically for the familiar handles of my sharp-nose pliers and my diagonal cutters. Also, for your information, a flattened tenpenny nail is a darned poor substitute for a knob-set-screw screwdriver! The worst, though, was that two-pound, torch-heated soldering iron. Working with it in a radio was just like trying to use a fence-picket for a toothpick.

"A taste of that hard-way servicing really made me appreciate the instruments and tools we have here," Mac went on as his eyes swept affectionately down the length of the service bench; "and I made up my mind to take even better care of this equipment in the future than I have in the past. What's more, while I was at it and just to save you the trouble, I made a resolution for you to do the same thing, Buster!"

"Gee, thanks, Boss!" Barney said with an impish grin.

-30-

## MICROPHONE FIXTURES FROM ELECTRICAL SWIVELS

By ARTHUR TRAUFFER

THE low-cost ball and socket swivels made for electric lamp fixtures make mighty handy microphone fittings.

Fig. 2A is an exploded view of the swivel. The cap and shell are joined by means of  $\frac{5}{8}$ "-27 threads which are the standard threads for mikes!

Fig. 2B shows how the swivel shell can be used as a reducing adapter to fit a mike to a folding and telescoping photolamp stand. Most of these lamp stands have  $\frac{3}{8}$ " diameter draw tubes, so thread the draw tube with a  $\frac{1}{8}$ "-27 NPT die, screw the swivel shell into the tube, and you have a portable mike stand.

In Figs. 1 and 2C, a complete swivel is added between the swivel shell and the draw tube to provide a swivel for the mike. The mike can then be lowered or tilted to avoid obscuring the user's face.

Fig. 2D shows how a spare swivel cap

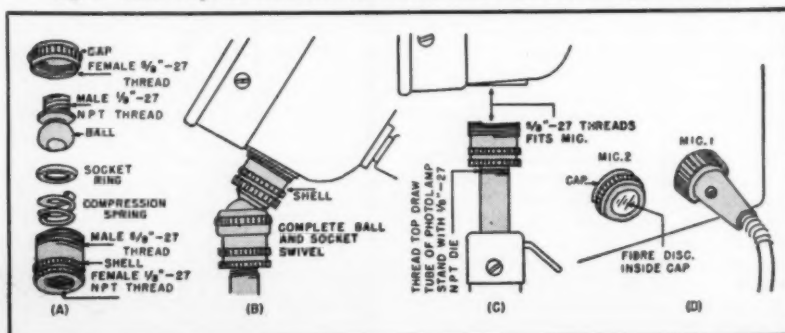


Fig. 1. Swivel used with mike and stand.

can be used to seal an unused mike input. A fiber or metal disc inside the cap closes the hole. The metal disc can be soldered to the cap.

-30-

Fig. 2. Three ways in which electrical swivels can be used as microphone fittings.



## International Short-Wave (Continued from page 109)

**Guatemala**—TGNA was recently heard on (announced) 5.995 with fair level but with bad CWQRM at times; was in dual with 9.668 when noted 2205. (Bellington, N.Y.) TGWA recently moved lower in the 31-m. band. (Bellington, N.Y., others) Measured 9.7588V at 1905; previous measurements included 9.7636 and 9.7643. (Oskey, N.J.) Sutton, Ohio, reports a new Guatemala outlet on 15.305, noted 0800-0830.

**Haiti**—4VEH, Cape-Haitien, verified in 25 days; says uses 9.550 which is switched at times to 9.557; listed *English* for Sun. 1915. (Young, Ky.) 4VRW, 9.84, Port-au-Prince, noted 2045-2120. (Poza, Cuba)

**Holland**—Hilversum has *English* for North America 2130-2210, 11.73, 9.59; for South Africa, Great Britain, Ireland, Continental Europe, 1500-1540, 11.73, 9.59, 6.025; for South Asia, 1100-1130, 15.22, 11.73; for Australia, New Zealand, Pacific Area, 0530-0610, 21.48, 17.775, 15.22, 6.025. "The Happy Station Program" of Eddie Startz is now on *Sundays only*—0530-0700, 21.48, 17.775, 15.22, 6.025 to the East, Pacific Area, Europe; 1100-1230, 15.22, 11.73, 6.025, to Near and Middle East, Europe; 1630-1800, 11.73, 9.59, 6.025, to South and Central America, and 2130-2300, 11.73, 9.59, to North America.

**Honduras**—Cadena Radial Hondurena operates on 850 kc., m.w., 300 watts (announces Radio Monserrat, HROW); 6.02, 500 watts (announces Radio Reloj Musical); 6.675, 2 kw. (announces Radio Monserrat, HROW, La Emisora de los Hondurenos); complete schedule for all channels is 0750-2300; all-Spanish; QRA is HROW, Radio Monserrat, Parque Finlay, Tegucigalpa, Honduras. (Serrano, Brazil) HRD2, 6.235, "La Voz de Atlantida," noted 2121-2145 in all-Spanish program. (Patterson, Ga.) HRXW, 8.990, Radio Comoyaguilla, noted to 2300 sign-off; Radio Progreso, San Pedro Sula, 6.187, signs off 2300 to 2310; a station noted lately on 6.177 evenings (EST) is believed Radio Tela, at Tela, a small town up the coast from La Ceiba; signs off 2200. (Stark, Texas)

**India**—VUD, 17.740, Delhi, noted 0600-0945 at fair strength, replacing 17.840. (Legge, N.Y., via NNRC) Heard on this channel 0830-0945, announcing 15.29 in parallel; the 1400-1500 broadcast in *English* still noted on 9.720, 7.155. (Pearce, England) Still heard 1930 with news on 15.29 (announces 11.85 in parallel). (Morales, La., others) The 15.16 channel is heard well in West Virginia around 2100. (Dalton) Is scheduled on that channel daily 2030-2200 with native all-musical session. (Bellington, N.Y.) The 7.155 outlet is good early mornings (EST) in Calif.; noted opening 1045 with news on 11.83, 1529. (Dilig, Calif.)

**Indo-China (Vietnam)**—Ferguson, N.C., recently measured Radio France-

August, 1951

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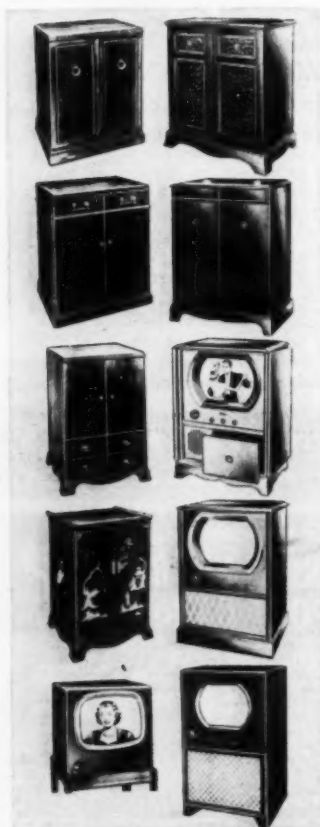
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Asia, Saigon, in 31-m. band as 9.799; noted mornings (EST). At the time this was written, Balbi, Calif., noted RFA from 0520 sign-on using 9.799 and 7.225; sign-off is around 1030. Balbi says the station on 7.265 sounds very much like "Vietnam," noted weak to fair after 0200, but is not readable at 0915 when "Vietnam" has news on 9.620. Later report from Balbi says has heard "La Voix de Vietnam" on a new channel of 6.107 with French 0800-0830 and with the English news 0915, parallel 9.62. And Rosenauer, Calif., flashes he has heard "La Voix de Vietnam" on 7.105 at 0830-0930 sign-off, carrying the news 0915 in parallel with 9.620.

RFA, 11.78, Saigon, noted signing off 1025 after "La Marseillaise." (Russell, Calif., others) Has news 0900. Heard on 11.83 by Rosenauer, Calif., 0400-0500 with English session. More recently, Balbi, Calif., notes it on either 11.84 or 11.83 (seems to alternate or at least vary) with news both 0400, 0500, and signing off on that frequency 0515.

*Iran—Radio Teheran*, 15.100, is good level in 1500 news. (Boice, Conn.) Still signs off 1530 after Russian period (this usually is jammed!).

Verification was received recently for 3.930, Teheran; listed outlet on 3.960 as EQO but in QSL gave the 3.930 outlet as EPP. (Peddle, Newfoundland)

*Iraq—Baghdad*, 7.092, now closes 1415 after a newscast in Arabic; however, on Sundays the Arabic runs to 1428, followed by Western recordings to 1510, according to British sources. Dilg, Calif., hears a station on this channel 0930 that is most likely *Radio Baghdad*; fairly good level.

*Ireland—Radio Eirrean*, 17.84, not reported to me lately. Channel was checked recently by Cox, Dela., and myself, at 1230 and 1330 (should have news at one of those times) but *Radio Eirrean* could not be located. The station recently sent this message to Russell, Calif.—"The 100 kw. transmitter was completed about three years ago, but the new government coming into power at that time decided that in view of the demands of the other public services, the expenditures which would be necessary on the short-wave transmissions would not be justified, so the projected programs did not materialize." (Results of the recent election in Eire might change the situation?—KRB)

*Israel—Tel Aviv*, 17.665, is a radio-telephone station—not a broadcast outlet. (Peddle, Newfoundland)

Although *Kol-Israel* was scheduled to inaugurate its new 50 kw. transmitters (s.w. and m.w.) on May 14—Israeli Independence Day—at the time this was compiled, it appeared that the new high-powered station was not yet on the air. (Pearce, England; Bellington, N.Y., others) Channels to try include 9.010A, 9.500, 9.640, 11.935, 15.415, 17.880, 21.465, and possibly 6.830.—KRB

Noted on 9.010A with Yiddish 1100 and with the usual "Voice of Zion"

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**RADIO & TELEVISION NEWS**



(English) session 1615-1700 sign-off. (Pearce, England) The 1615-1700 English period noted also in West Virginia, but at weak level lately.—KRB

**Italy**—Of the several frequencies used by Rome evenings (EST) to North America, 15.420 seems the best (usually with a "local powerhouse" signal). Has news 2145-2200 sign-off.

**Jamaica**—Radio Jamaica, Kingston, has moved from 3.36 to (announced) 4.82; has good signal with only slight QRM, is much better than when on 3.36; does not have BBC news relay 2300 any longer but closes with "God Save the King" at that hour. (Bellington, N.Y.) Noted by Oskay, N.J., 1945, measured 4.820. Widely reported.

**Japan**—AFRS, 9.605, Tokyo, good to excellent in Oregon; becomes audible around 2000. (Slattery) AFRS, Tokyo, now stays on JKI4, 11.80, JKL2, 9.605, to 0500, when is replaced by JK13, 6.175, JKL, 4.860; Tokyo's Home Service, JBD3, 15.225, JKI2, 9.655, now is on to 0415, when JKI, 4.91, JBD, 9.505, JBD2, 9.56, take over; JKM2, 9.695, signs off 0400, replaced by JKM, 4.94; Tokyo has a new frequency of 6.135, heard only 0400-0500 in parallel with JKI, 4.91, and JKJ; the JKJ and JKH stations noted from around 0100 onwards; also 6.19 is on as late as 0730, while JO8G, 6.005, signs off around 0600; the 6.015 channel is now heard in the Home Service with powerful level 0800-1000. (Balbi, Calif.) JKH, 7.257, and JKJ, 7.285, noted with good signals around 0600 but carrying separate programs (all-Japanese). (Dary, Kans.)

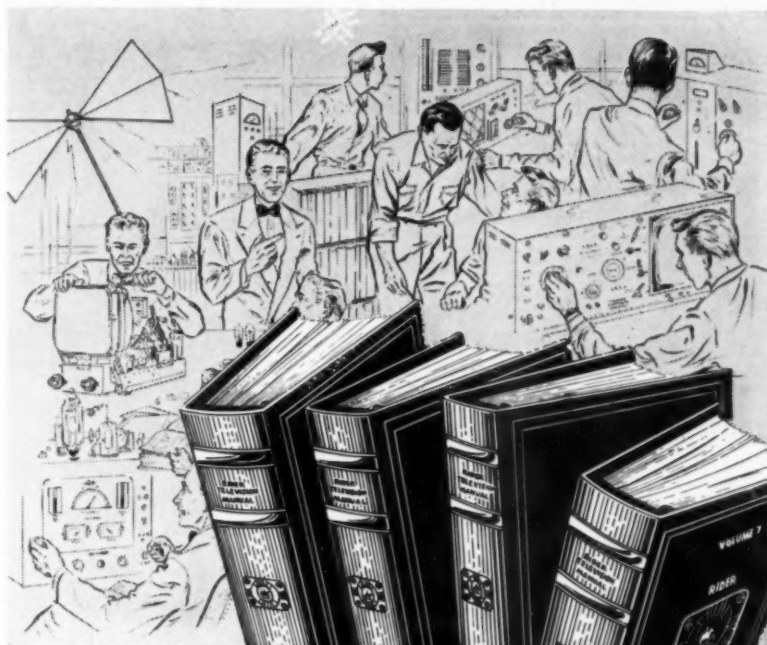
**Kenya Colony**—Leslie Knight, FBS, Middle East, says now that the FBS outlets at Malta are being moved to Fayid, Suez Canal Zone, the only FBS outlet currently in use is Mackinnon Road, 6.115, 150 watts, scheduled weekdays 2200-0000, 0430-0630, 0900-1400, Sun. 0000-0600, 0800-1400, Sat. 2200 (Fri. EST) to 0000 (Sat. EST), 0430-0630, 0900-1500. (Hankins, Pa.)

VQGI, 4.855, Nairobi, noted 1445-1501 sign-off. (GDX-aren, Sweden) Noted by Pearce, England, closing 1400 except Wed., Sat., when runs to 1500; notes BBC news relay 1300, then local news, weather forecast, South Africa news (1315), then music and verse for relaxation at 1330.

**Korea**—At the time this was compiled, only Korean outlet reported to the ISW DEPARTMENT was that heard by Dilg, Calif., on approximately 4.775, definitely a "South" Korean outlet—probably at Pusan—noted best before 0900.

**Lebanon**—Ici Radio Liban, 8.036, Beirut, noted in French 1445, then going into Arabic 1515. (Pearce, England) Noted in Arabic also 1215, with bad CWQRM. (McWalter, Scotland)

**Madagascar**—Radio Tananarive, 9.515, noted with weak signal 2230 sign-on; the 9.693 channel heard 2330 with Malgache music, through heavy QRM from LRA, Buenos Aires, 9.690. (Cox, Dela.) Sun. sign-on of the 9.515 channel is still 0000. (Machwart, Mich.)



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Malaya — BREBS, Singapore, has been coming through with good level mornings around 0600 on its 9.69 channel. (Oskay, N.J.) Is using 7.120 now but *Radio Malaya*, also Singapore, is still on 7.200. (Rosenauer, Calif., others) Is now using new high-powered (probably 100 kw.) BBC transmitter; Frequencies employed at times during the daily 0415-1130 schedule now include 21.72, 17.755, 15.30, 11.88, 7.120, 6.175. (Boice, Conn., others) *Radio Malaya*, 6.025, Kuala Lumpur, noted 0900 with news. (Russell, Calif.) Also has news 0630. (Rosenauer, Calif.)

Monaco—*Radio Monte Carlo*, 9.785, 6.035, now signs on 0100. (Pearce, England; Machwart, Mich.)

Mozambique—Lourenco Marques noted in Portuguese 1233 on approximately 9.855. (Pearce, England) *English* session still noted from 2300 sign-on on 4.920 (weak to fair) and 11.767 (stronger). (Dary, Kans.)

New Zealand—New schedules of *Radio New Zealand*, Wellington, are 1300-1545, ZL2, 9.54; 1600-0145, ZL10, 15.22; 0200 to closedown, ZL2, 9.54, all these to Australia; 1300-1545, ZL8, 9.62; 1600-0145, ZL4, 15.28, and 0200 to closedown, ZL8, 9.62, all these to Pacific Islands; closedown is 0545 weekdays; 0620 Sat.; 0500 Sun.

Nicaragua—Bellington, N.Y., reports a Nicaraguan outlet on 11.78 some evenings (*EST*) around 1800 and later with popular American songs; fair level; may be YNOW on a new channel?

Pakistan—A "General Overseas Service," news at slow speed, is reported daily 1210-1230 from *Radio Pakistan*, Karachi, on 7.010 and 11.650. (Radio Sweden) Pearce, England, confirms schedule—but says hears it on approximately 11.915 (announced 11.914, 6.240). Noted on 17.770 with news 0110-0120 (Home Service) followed by news in Bengali, and again with news 0210-0220 (Home Service) followed by news in Urdu. (Pearce, England) Morales, La., reports *Radio Pakistan* on approximately 15.600 with news 0700. Sanderson, Australia, lists the 0700 news heard on 9.755 and 11.885, then a program in Urdu. Overseas sources says Lahore is on 4.810, and has news relay from Karachi 1015-1030.

Peru—The Peruvian outlet heard on 9.49 closing down 2225 is *Radio Tacna* with call OAX6H, listed 9.500. (Serano, Brazil) Lima, 5.980, opens 0615; closes 0100. (Morales, La.)

Philippines—The Far Eastern Broadcasting Co., 9.733A, Manila, has news 0500. (Stark, Texas; Stein, Calif.) Is using DZAS, 6.80 mc.; DZB2, 3.320; DZH6, 6.030; DZH7, 9.730; DZH8, 15.300; soon should have an additional channel (DZH9, in the 25-m. band—probably around 11.885); schedule is weekdays 1700-1815, Japanese, Russian, Indonesian, Mandarin on 15.300, 9.730; 1830-2000 *English* on all frequencies; 2030-2330 various oriental languages on 15.300, 9.730, 6.030; 0700-0835, *English* on all frequencies; 0900-1200 various Middle and Far East lan-

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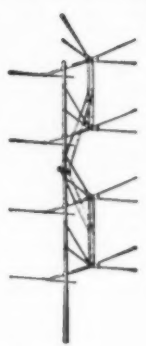
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guages; Sundays 1700-1745 Japanese, Chinese on 15.300, 9.730; 1800-2300 English on all frequencies; 0000-0015 Japanese on 15.300, 9.730; 0030-0600 English on all frequencies; 0630-0715, Chinese, Mandarin on 15.300, 9.730, 6.030; 0730-1030 English on all frequencies; 1100-1200 Arabic, Yiddish, Russian. (WRH Bulletin). Noted in Calif. on 15.300 with news 0000-0010, then religious program. (Russell) DZ13 is on about 6.098. (Balbi, Calif.) The Philippines Broadcasting Corporation, 9.500, Manila, noted 0500 with recordings. (Win, Calif.)

**Poland**—Radio Warsaw now has English for North America 1745 on 11.815, repeated 2315 on 9.57; 1930 on 11.815, repeated 0030 on 9.57; usually has terrific QRM on 9.57 from U.S. outlet, same channel. (Bellington, N.Y.) Noted on 11.815 at 1930-2000 in English, then into Polish; fine level and no QRM. (Chatfield, N.Y.; Hoogerheide, Wisc.) Warsaw announces English for Europe 1230-1300, 1350-1420, 9.525; 1315-1345, 1615-1645, 9.570. (Pearce, England)

**Portuguese Guinea**—Bissau is still heard most days from 1630 with musical programs on 5.839. (McWalter, Scotland)

**Portuguese India**—No sign of the "purported" Radio Goa on 9.260. (Pearce, England, others) Probably still is on 9.610.—KRB

**Roumania**—Bucharest, 9.252, lately has had English 1530 rather than (former) 1400; French noted 1500; announced as parallel in 25- and 48-m. bands (probably 11.900, 5.990). (Pearce, England)

**South Africa**—Cape Town, now on 5.890 (formerly 5.880A), is again coming through in Delaware; noted 0000 with news to 0010, then music; occasionally blocked by powerful carrier. Johannesburg III, 4.895, noted parallel Cape Town 0000 for news, weather data; identified 0015 with chimes; faded 0030. (Cox)

Current SABC schedules are—Johannesburg on 4.80 at 2345-0230 (Sun. 0055-0230) 7.290, Mon.-Fri., 0315-0715, 0900-1130, Sat. and Sun. 0315-1130; 3.29, Mon.-Fri., 1140-1605, Sat. 1140-1645, Sun. (1200-1605). Johannesburg (Commercial Programs) on 4.945, Mon.-Sat. 2300-0230; 7.295, Mon.-Sat. 0130-1100, Sun. 0100-1115; 4.945, Mon.-Sat. 1100-1400 (Sun. 1115-1400); 3.35, Mon.-Sat. 1400-1700 (Sun. 1500-1600). Cape Town (Afrikaans) on 5.89, Mon.-Fri. 2345-0230, 1145-1605; Sat. 2345-0230, 1145-1645; Sun. 0055-0230, 1145-1605; on 9.615, Mon.-Fri. 0315-0715, 0900-1130, Sat. 0315-1130, Sun. 0315-1130. Pietermaritzburg (Afrikaans) on 4.878, Mon.-Fri. 2345-0230; 0315-0715, 0900-1605; Sat. 2345-0230, 0315-1645; Sun. 0055-0230, 0315-1605. Experimental Transmitter, African Service, Johannesburg Program, on 15.23, 0330-0715, 0900-1045; 9.87, 1100-1505 (Sat. to 1645); on Sun., Mon., Wed., Fri. has Afrikaans; on Tues., Thur., Sat. has English. Experimental transmitter to South West Africa (Johannesburg Program), has English program on

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9.68 same times as Johannesburg's English sessions. (Hannaford, Sou. Afr.)

**Spain**—Lately, Madrid has been on about 9.355 rather than listed 9.369. (Bellington, N.Y., others) Measured 9.356V at 1850; two days later at 1605 was measured 9.3517; measurement some time ago was 9.368. (Oskay, N.J.) Alicante is moving around again; noted recently 1600 near 8.24, strong signal but poor modulation; noted later 1530 back near 8.140. (Pearce, England) World Radio Society, Sweden, lists FET1, Radio Falange de Valladolid, on 7.006, heard 1530-1600; and EAJ9, Radio Nacional de Espana en Malaga, 7.022, heard 1600.

**Surinam**—Paramaribo, 15.407, noted signing off 2058 with Dutch National Anthem; good level but with slight QRM from Rome's 15.420 outlet; announces "Radio Surinam." (Dary, Kans.) Has English religious programs Sundays 1800-1830. (Sutton, Ohio)

**Switzerland**—Berne noted on 15.120 with news 1200. (Cox, Dela.) International Red Cross, Geneva, on 7.210, heard 1655 with call in English, French, Spanish, German, asking for reports on strength, quality, to International Committee of Red Cross, Geneva, Switzerland; said tests in English 0130, 0700, 1530, 1700. (Pearce, England)

**Syria**—Damascus noted near 9.585 with news 1630; announced as operating in 25-, 41-, and 50-m. bands, and announced news for 0600, 1630; another day heard with news 1630 near 11.920 and near 9.585. (Pearce, England) Radio Sweden reports Damascus testing on 6.165, 9.55, 11.915 at 2330-0200, 0630-0830, 1110-1630, 1630-1730.

**Tahiti**—Radio Tahiti, 6.135, Papeete, now seems scheduled 2300-0130 although at times may end transmission 0050. Appears to have English program Wednesdays 0000-0015. (Slattery, Ore.) Current schedule confirmed; signs off now 0130 with "La Marseillaise." (Bellington, N.Y.) Swedish sources report Radio Tahiti with its new 24 kw. transmitter heard on 9.053 ending English broadcast 0030. Not confirmed by ISW DEPARTMENT monitors in USA who have checked regularly for this one.—KRB

**Taiwan (Formosa)**—BED7, 7.133, Taipei, is probably best of the Nationalist Chinese outlets currently, very good signal with news 0630; BED6, 11.735, Taipei, fair level, parallels 7.133, holds up to about 1000 on West Coast; BEC22, 7.010, Taipei, heard fairly well around 0900; BED32, 8.995, Taipei, fair signal, leaves air around 0900. (Dilg, Calif.) The Home Service of "Voice of Free China" now signs on 0300 (one hour earlier) on 8.99, 7.000, 6.095 (BED29); not heard on 6.40 any longer. (Balbi, Calif.) Sanderson, Australia, lists BED44, 7.000, at 0630 with Chinese-English lesson; BCAF, 8.996, at 0630 with "Bringing Christ to the Nations" (English) but didn't state what day (most likely Sun. or Wed.—KRB). Cushen, N.Z., reports a new Taiwan outlet heard on 7.360 around 0700.

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Tangier—Pan-American Radio, 7.400, noted 1500 when clock strikes 9 p.m. (Cushen, N.Z.)

Thailand—Bangkok noted on 6.24 with native program around 0800; weak, badly QRM'd. (Balbi, Calif.) Heard on 11.91 at 0550 with news and music. (Sanderson, Australia)

Turkey—TAT, 9.515, still noted in experimental English period to North America daily 1815-1900; asks for reports to English Section, Radio Ankara, Ankara, Turkey. (Simonian, Mass.; Kinge, N.Y., others) TAV, 17.825, Ankara, noted 0630-0715 in English to Australia, New Zealand; fair strength. TAU, 15.165 (announced 15.160 but measured 15.165 by Oskay, N.J.), is heard well 1315-1600 with programs for Europe, having replaced TAS, 7.285, for the summer. (Legge, N.Y., via NNRC, others) Pearce, England, notes TAU, 15.165, to Europe and British Isles in English now 1500-1545, parallel TAP, 9.465; Mailbag session Sundays is still 1530 on these channels, according to Bellington, N.Y., others.

National anthem of Turkey, which concludes most short-wave broadcasts from Ankara, is "The Independence March." (Bellington, N.Y.)

Uruguay—CXA19, 11.835, Montevideo, Radio El Espectador, 5 kw., noted 1950-2200 sign-off with varied music; best 2000-2130. (Rastorfer, N.Y.)

USI—YDE, 11.77, Djakarta, noted with news 1025; announces "This is the Voice of Indonesia, broadcasting from Djakarta"; signs off 1030 with chimes, carrier returns 1035, chimes 1059 and then re-opens with announcements in foreign language. (Russell, Calif.) Radio Indonesia, Menado, Celebes, 9.830, noted 0830-0945 sign-off; popular Western music with announcements in Indonesian; identification is "Disini Menado, Radio Indonesia Serikat"; good level in Calif. (Rosenauer) YDQ2, 9.552, Makassar, Celebes, noted around 0900 with native announcements and music; woman announces at 0930, then program continues in native. (Russell, Calif.)

USSR—Radio Moscow noted in English 1230 (probably for Europe) on 15.36, 11.63, 9.83. (Chatfield, N.Y.) Noted on 15.36 in English 1300-1400 for Europe. (Leary, Ind.) Heard there with English in progress 1135. (Bellington, N.Y.) Radio Tashkent, 6.825, lists English daily 1000-1030, 1115-1130. (Radio Sweden)

A Soviet outlet is noted on 11.755 as early as 1915 to 2230 sign-off; last period is Spanish. (Leary, Ind.) Also noted evenings by Weldon Wilson, URDXC, who also reports Moscow heard on 15.425 at 1700.

Petropavlovsk, 6.07, does not have Chinese transmission on Sundays 0530-0615 but carries Home Service in parallel with RV15, 5.94, at that time; 7.40 and 5.265 also are off Sundays in Chinese transmission. (Balbi, Calif.) Khabarovsk, 5.940, noted with good signal lately 0530-0615; features musical request concerts for Germany; a stronger outlet of Khabarovsk is 6.075 in Russian to 0530 when there is a

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three-minute break, a woman announces in Russian that the program is beamed to the Far East; at 0530, "The Democratic Youth Song" is played after which program continues in Chinese—with the Russian language section being carried on 5.940. (Grishott, Calif.)

Vatican—HVJ noted with news 1000-1015 on 15.120, 11.740, 9.646; announces English for 1315 on 25.55, 31.10, 50.26, and 196 meters (try 11.74, 9.646, 5.969). (Pearce, England)

Venezuela—YVLK, Caracas, is harmonic of 4.970; heard evenings. Do not confuse. (Legge, N.Y., via NNRC)

\*\*\*

## Press Time Flashes

While Radio Sofia, Bulgaria, announces English for Europe at 1500, 1600 on 6.070, it has been heard usually on 15.33. (Bellington, N.Y.) If not found on 15.33, the 6.070 channel should be checked.—KRB. Pearce, England, flashes he has noted Sofia on 6.070 with news 1500-1515 and announcing further English for 1600-1630 (when is severely QRM'd by the BBC's European Service on that channel).

ZAN, 11.670, location unknown, was heard testing recently in English with SDQ3, Sweden, 1745-1900; said would test again the next "night." Is possibly Albania, judging from call. (Focht via NNRC)

Serrano, Brazil, flashes this "unconfirmed" tip—a new station is operating in Macau, Portuguese China; is Radio Vila Verde, testing on 9.500 with transmissions in English, Portuguese, and Chinese; schedule unknown. Can anyone confirm?—KRB

According to Short Wave News, London, "Radio Guinea," Conakry, operates on 10.230 with 1 kw., daily except Sun. 0715-0730. Can anyone confirm?—KRB (Fr. Guinea is a part of Fr. West Africa, with an area of 96,885 square miles and a 1931 population of 2,065,527.—KRB)

Radio Sweden recently issued this information on "clandestine" outlets—Radio Stanica Jugoslovenskikh Revolucionarnich Emigranta is audible daily 0030-0050, 0900-0945, probably also in the "evenings" (GMT) on 6.888, 7.444. Radio Euzkadi, La Voz de la Resistencia Basca, is heard on 6.560 at 1600-1630. The Russian Underground Station (believed somewhere in Western Germany)—KRB) was heard recently 1535 on 7.730 and another day 1500 on 7.550; usually is jammed.

A flash from Pearce, England, at press time, says he now hears Damascus, Syria, only on 11.920A with news 1630-1640; music 1700-1730, then news in French; announces "Service to Europe on 26 meters."

Hannaford, South Africa, flashes that he has heard "Radio Chad," 15.596, Fr. Equatorial Africa, 0030-0130 daily; has prayers and music; male announcer only, calls "Houna Radio Chad" and uses reed instrument at beginning and end of session. (Chad is a colony of Fr. Equatorial Africa—French Congo—with 461,202 square miles of area,

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and a 1931 population of 1,432,555.—KRB)

Dilig, Calif., flashes that *Radio Peeking* recently announced a frequency of 15.170 in addition to other channels (10.260, 11.685, 15.060, and probably 6.100—KRB).

Hollandia, Dutch New Guinea, noted on 7.150A at 0527 playing "Goodnight, Sweetheart" song after which announcer said "Gut Nacht"; but continued with American recordings, so may have been a relay; 0615 had Dutch talk and signed off 0630 with Dutch National Anthem; don't confuse with Indian on 7.155. (Dilig, Calif.)

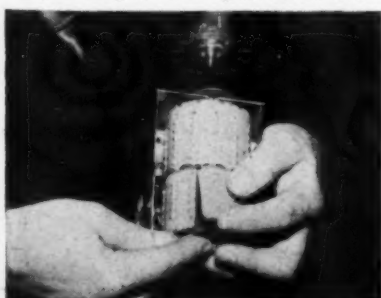
Summer schedule of *Radio Moscow* to North America in *English* is—0800-0830, 17.83, 15.44, 15.20, 15.12, 11.96, 11.91, 11.63, 9.83; 1820-1930, 2030-2300, 15.23, 15.18, 15.11, 11.91, 11.82, 11.81, 9.83, 9.67, 9.55; 1930-2030, 15.23, 15.18, 15.11, 11.82, 9.67; and to Pacific Coast, 2300-0100, 17.81, 15.23, 15.18, 15.11, 11.82. Programs in *English* to the Far East and Europe are scheduled 0300-0330, 17.81, 15.10, 11.78; 0400-0500, 17.81, 15.44, 15.36, 15.20, 15.10, 11.63, 11.78, 9.68; 0530-0600, 17.84, 17.81, 15.36, 15.41, 15.20, 11.78, 11.63, 9.68.

Tangiers, 6.247, operates Mon.-Fri. 1200-1300 with various language-editions of "Bringing Christ to the Nations"; uses 17 languages; *English* edition is Wednesday 1200; for world coverage, 36 languages are used over some 1200 stations located in 51 countries for "Bringing Christ to the Nations." (ISWL, London)

#### Acknowledgement

Thanks for the many fine reports. Keep them coming to Kenneth R. Boord, 948 Stewartstown Road, Morgantown, West Virginia, USA. . KRB

Standard Coil Products Co., Inc., of Chicago recently demonstrated how a simple transfer of coils permits any television receiver equipped with a Standard Tuner to be used for u.h.f. reception. Since over 4,500,000 contemporary receivers, or approximately 40 per-cent of the total in use, are so equipped, this means that a simple and economical adjustment of the tuner will be all that is required to obtain u.h.f. reception. The demonstration was conducted at Bridgeport, Conn., using several standard receivers and signals transmitted from RCA's experimental u.h.f. station, KC2XAK. The sets were adapted in less than five minutes by an interchange of channel coils within the tuner. According to the company, the process even with the combined cost of time and labor plus the u.h.f. coils themselves will run lower than the price of a separate converter.



August, 1951

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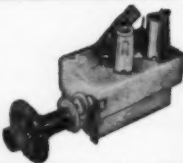


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# RADIO-TV Service Industry News

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**WE** NOW have an authorized system for color television. It is called the *field sequential system* and was perfected in the research and development laboratories of the *Columbia Broadcasting System*. It is a highly controversial system because it requires an entirely different set of standards than the present system of monochrome TV and also because, in the present state of the art, the color is reproduced by means of either a motor-driven drum or disc. However, the field sequential system is *not* irrevocably tied to this method of color reproduction. Tri-color tubes or any other method of color reproduction that is applicable to any other color system can also be used with the *CBS* color TV system. At the present time the motor-driven disc or drum provides the most practical and economical means of color reproduction with a high degree of color fidelity.

The new color TV standards call for different scanning rates than our present black-and-white television. Because of this present receivers cannot reproduce color telecasts in black-and-white until they are adapted to follow the

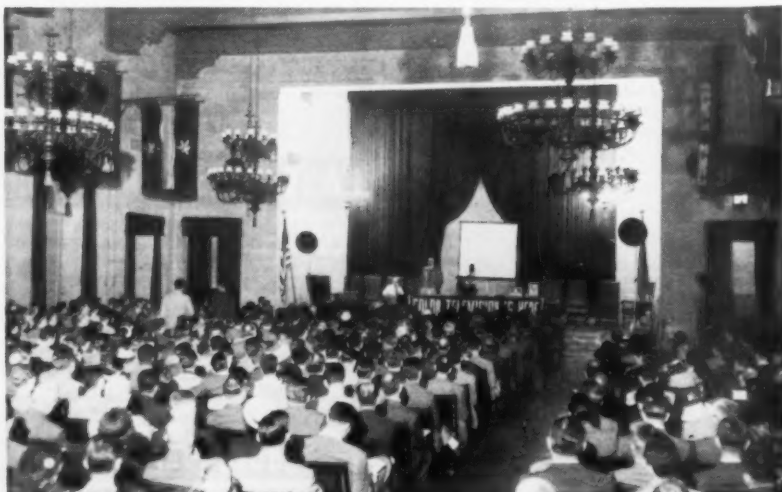
color transmitter's new line, field and frame rates. This particular requirement is the major disadvantage of the *CBS* system. Because of this the field sequential system has been designated an "incompatible" system.

A decided advantage of the *CBS* system is that present transmitters can be modified, at a nominal cost, to telecast pictures in color—or rather, by the new line, frame and field rates—and that practically all receivers now in use can be adapted and converted to receive these telecasts and reproduce the pictures in color.

This department is not concerned with the relative merits of the different systems of color TV. To argue their respective pros and cons is like arguing politics or religion.

A system for color television has been approved. The general public will, in the final analysis, present the verdict that will either approve or disapprove of FCC's action in selecting the field sequential system. If past experience teaches us anything it is that the one best way to perfect a product is to get it out of the laboratories and into the hands of commercial companies and the general public where

An overflow crowd of technicians jammed the main auditorium of the U.S. Chamber of Commerce Building in Washington D. C., to witness a demonstration of color TV presented by CBS engineers and to hear Edward M. Noll's lecture. Sponsored by Rucker Radio Wholesalers of Washington and presented by the Television Technicians Lecture Bureau, this was the first of a series of color lecture-demonstrations for TV shop owners and technicians to be presented jointly by CBS and the Bureau.



use will dictate the needed changes and improvements.

The major concern of this department is in how color television developments will affect the radio-TV service industry.

There are more than ten million television receivers now in use. Most of these sets can be adapted and converted to receive and reproduce pictures in color with the CBS system. Assuming that the public will accept color television and a popular demand for color telecasts sweeps the country—as it did for our present monochrome television—what will happen in the service business? Will the trend be toward the adaptation and conversion of the users' present receivers or will the major demand be for new receivers, factory-equipped to reproduce color television? If the demand is for new color receivers and the present receivers are traded in, will a new business spring up to sell converted used television receivers?

From the standpoint of the service industry the widespread acceptance of color television will present some interesting and unusual possibilities. To get a clear picture of what is involved let's briefly examine the several ways in which current receivers can be modified to receive and produce color pictures.

#### Methods of Modifying Receivers

The first step in modifying a receiver for color is to *adapt* it to produce a black-and-white picture with the new scanning rates. With some of the present sets this modification or adaptation can be accomplished rather simply by adding several new component parts with a switching arrangement to retain the receiver's usefulness in receiving black-and-white pictures telecast under our present standards.

However, what will probably prove to be the most satisfactory and popular method for adapting sets will be to use factory built adapter units. These complete assemblies, designed for use with specific circuits, will permit the adaptation of a receiver without adding parts to its present circuits. Such adapters will connect to the sets by means of adapter plugs inserted in specific tube sockets. They will contain all of the necessary circuitry to produce the new scanning rates.

After the set is adapted the picture will appear on the face of the CR tube as a black-and-white picture. It is necessary to add a *converter* to be able to see the picture in color.

To convert any of the present sets it will be necessary to use the circular type of color disc. The maximum practical size of picture that can be produced with the circular color disc is about 12½". A motor drive unit and motor speed control circuit together with the disc make up the color converter. Since practically all of the color converters will be available as complete, enclosed assemblies, a suitable magnifier will be included with it to present a larger image.

Then there will be the "color com-

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panion" sets which several manufacturers have developed. This is a "slave" type of receiver that contains its own picture tube, color converter, and the necessary electronic circuits for color requirements. It is connected to the driving set through a cable and socket adapter. The present receiver is left intact and continues in use for black-and-white pictures from monochrome stations. The companion set is used only for the color pictures.

#### Potential Modification Business

Five years ago when television first burst upon the post-war scene direct view TV receivers were limited to seven and ten inch picture tubes. However, design and production problems were whipped rapidly and the larger direct view tubes became commonplace. This development occurred so fast that the bulk of the smaller screen sets were sold mostly in the early television areas.

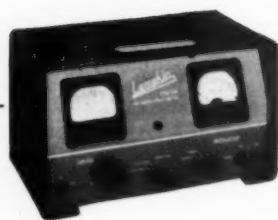
It wasn't too long after the smaller screens became passé that ingenious suppliers started to offer conversion kits for converting these sets to larger tube sizes. Although this conversion business has been confined to a very few areas, alert TV service contractors in those areas found it to be a substantial and profitable business. Many of them set up production line systems for converting receivers and by concentrating their conversion sales efforts on a single, widely-used model at a time they have been able to maintain a consistent level of service income from this activity.

With more than ten million TV sets now in use and a half million-plus completed receivers stacked up in warehouses crying for buyers it is not difficult to visualize the tremendous business potential that would result from a wide-spread TV user demand for color television. It is estimated that the average receiver can be adapted and converted to color at a cost of \$150.00. With that tremendous income potential it is entirely possible that a new "color modification" industry will join the television ranks.

But what can it mean to the man who is running a one-man, five-man, or twenty-five-man independent service business? Is this one of the potential possibilities in TV installation and service that impelled a giant company like Western Union to get interested in it?

The first impact of color TV will come in the present major television areas. During the first few months that color TV will be on the air color telecasts will be available only at odd hours during the day and perhaps late in the evening. It will take some time for manufacturers to design, tool up, and produce the adaptation and conversion accessories necessary for wide-spread receiver modification. However, it has already been announced that several advertisers, some of whom have never used time on black-and-white television, are prepared to sponsor color television programs.

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cessful independent TV installation and service companies in business in the areas where color will first be tried. These service companies are owned and managed by able service businessmen who built their businesses solidly enough so that they were able to weather the serious business storms that swamped the poorly managed shops.

These organizations will be alert to the new opportunities that color TV will provide and they are capable of taking full advantage of them. However, there is a top limit to the volume of installation, service, and conversion business that even the best financed and managed service companies can handle and continue to operate on a profitable basis. It has been clearly demonstrated that an independent service company can get to be too big.

So under the most favorable circumstances the present independent TV installation and service organizations in the major centers would be able to handle, at most, only a small percentage of the color modification, installation, and service business.

The most interesting aspect of the new business that color TV will create in television areas lies in speculating on whether new, independent service businesses will be organized to handle set modifications or will the larger receiver manufacturers expand their wholly-operated or distributor-operated consumer TV service departments to take care of this business. Of course, there is also the possibility that more big TV installation and service companies along the pattern of the proposed Western Union organization, will be created to grab a share of this new business.

It will provide ample opportunities for present small service operators who are able to finance and manage expanded businesses, to extend their activities on a sound basis. And it all adds up to a need for a growing army of skilled technicians that will be required by the business regardless of the nature of its financial ownership and management control.

Color television will add the impetus to business in the present TV-served areas that u.h.f. TV will furnish for presently non-television areas.

#### CBS To Sponsor Training Program

CBS plans to present a training program for experienced TV technicians on their color TV system. Although complete details of this program have not been announced they have been working on various phases of it for some time. Their recent merger with Hytron and Air King provides them with manufacturing facilities to produce receivers of their own design.

#### Opportunities for Small Dealers

It is highly questionable whether a small service business will be able to cope with the problems of color television. Color programs will educate viewers to be more critical of the quality of their pictures. It will dem-

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1B5	1.22	5X4G	.68	6C4	.63	6X4	.57	12SQ7	.57
1B7GT	1.22	5Z3	.63	6CB6	.76	6X5	1.01	12SR7	.76
1C5GT	.84	6AC7	1.10	6CD6G	2.28	6X5GT	.57	19B6G6	2.28
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1L6	1.01	6AK5	1.48	6F6G	.63	7E6	.84	25AV3	1.01
1LA6	1.01	6AL3	.68	6H6GT	.68	7F7	.84	25L6GT	.63
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1R5	.76	6AV6	.57	6L6G	1.10	7Z4	.68	35W4	.47
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1T4	.76	6B4G	1.22	6S4	.68	12AT6	.57	35Z5GT	.47
1T5	.91	6BA6	.68	6S8	1.01	12AT7	1.10	42	.76
1U4	.76	6BA7	.91	6SA7GT	.68	12AU6	.76	45	.76
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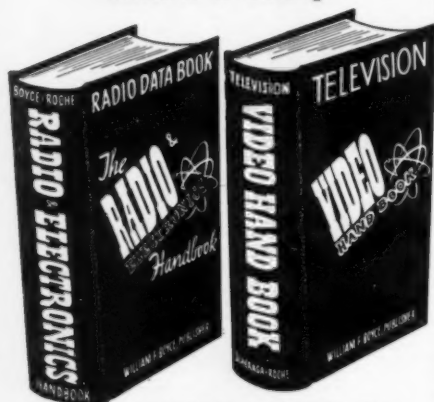
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And right around the corner is u.h.f. television. It will pose new requirements for service capability and efficiency. It will add another incentive for good set installations including, of course, an efficient antenna system.

In all major TV areas the skilled manpower demands on service companies will require managerial abilities that can be supported only by an organization of substantial size. In other words, a small company cannot support the necessary investment in equipment, supplies, stock, etc., and pay the necessary management salaries out of the income produced by a few technicians.

The opportunities for the small service companies will come in connection with u.h.f. TV developments in the smaller cities and towns. However, the demands that will be made on these new service businesses in technical facilities, TV installation and servicing "know how," and in service business management will be far more exacting than was required of the service operators who went into v.h.f. television in its early days.

Each receiver installation in an area that is essentially a u.h.f. area, will be in the fringe or far fringe range of other u.h.f. or perhaps v.h.f. stations. And it is quite probable that set owners in u.h.f. areas will want to get the maximum number of stations on their receivers that the best installation will permit. So a u.h.f. TV installation and service operator should anticipate that both the facilities and the ability to make good antenna installations will be a **MUST**.

### Nominal Business Requirements

Technically competent service operators and technicians who are hoping to establish themselves in the TV installation and service business when u.h.f. TV arrives should set up a "preparedness" program for themselves right now even though u.h.f. is still in the indefinite future. It will come and when it does business moves so swiftly that there is no time to learn what should have been known beforehand.

Preparation for a u.h.f. service business should embrace a continuing close study of both the technical developments in v.h.f. and u.h.f. and a study of the fundamental management problems of a retail service business. We have observed that competent service shop operators keep pretty well informed on technical progress and developments but neglect the study of business management.

The major hurdle for the technically trained service operator in entering the TV installation and service picture is that of efficient organization and man-

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REVEALING BOOK shows how "crack" operators develop high speed and proficiency. Learn code for Amateur or Commercial Radiotelegraph License or improve your sending and receiving

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agement of a TV service business. In the first place, a TV service business requires the investment of a substantial sum of money. If the necessary equipment, supplies and replacement tubes, and parts working stock are not purchased the business will deteriorate from inefficient operation. On the other hand, if the business credit is used to buy equipment or supplies that are really "capital investment," with the hope of paying for it out of income, the business will soon be in serious financial trouble. So it is excellent business insurance to arrange for adequate financing before you get into the TV installation and service business.

Another extremely important factor in the successful operation of any retail service business is in the proper management of "time." "Time" is the basic commodity that a service business has to sell. And the financial loss in a service business from wasted or inefficiently applied "time" is just as real as the loss would be to a groceryman whose employees wasted or destroyed the foodstuffs they handle.

Even a minimum sized TV installation and service business will have a substantial investment in replacement tubes and parts and in the supplies used in various phases of the activity. Here, too, substantial losses can occur unless adequate stock controls are maintained that will provide a constant check on all types of material bought and used.

Then there is a continuing sales problem to maintain a satisfactory volume of service business. Payrolls have to be met regularly if a stable technical organization is to be maintained. In order to keep your volume of service business at a satisfactory level you will have to make numerous and constant dealer contacts and have some sort of a continuing "service-sales promotional" campaign to set owners.

Gather and study all the data you can get about how successful TV service contractors manage their businesses. Develop a file of the various forms that are used by service contractors and study them in relation to the business you plan to develop. Make use of the sales promotional material that manufacturers make available to you. This material is prepared by men who are authorities on service merchandising and in using it you are putting these men to work for you. —30—



August, 1951

## "BEST SELLER" TV LITERATURE PACKAGE

- HINTS FOR BETTER PICTURES ON 630TV
- 630TV DIAGRAM WITH MODIFICATIONS
- ILLUSTRATED TV CONVERSION MANUAL
- PULSE KEYED AGC CIRCUIT DIAGRAM
- RMA RESISTOR AND MICA CODE CHARTS

Plus latest catalogs and flyers

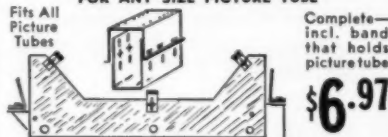
ALL FOR ONLY **\$1.00** POSTPAID

## 630 TV CHASSIS PARTS

RCA FRONT END TUNER, compl. w/tubes...	\$22.49
STANDARD TURRET TUNER, com. w/tubes...	22.49
ESCUTCHEON PLATE, for either tuner...	.69
DUMONT, INPUT TUNER, comp. w/tubes...	22.49
COMPLETE SET OF KNOBS, incl. decals...	1.34
COMPLETE SET OF KNOBS, (Cold) "	2.49
VIDEO AND I.F. KIT, 19 items...	7.84
ELECTROLYTIC CONDENSER KIT, 6 cond...	7.37
TUBULAR CONDENSER KIT, 37 condensers...	4.28
CARBON RESISTOR KIT, 107 resistors...	6.98
WIREWOUND RESISTOR KIT, 4 resistors...	2.31
BRACKET AND SHIELD KIT, 18 items...	8.63
TERMINAL STRIP KIT, 18 strips...	.59
OCTAL WAFER SOCKET KIT, 13 sockets...	.72
MIN. WAFER SOCKET KIT, 10 sockets...	.63
MIN. MOLDED SOCKET KIT, 2 sockets...	.22
CERAMIC CONDENSER KIT, 28 condensers...	3.37
MICA CONDENSER KIT, 11 condensers...	1.38
VARIABLE CONTROL KIT, 9 controls...	5.83
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HV FILTER CONDENSER, 20KV-500MMFD...	.79

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FOR ANY SIZE PICTURE TUBE



CRYSTAL-CLEAR LUCITE MASKS		
Tube Size—		Overall Dimensions
10" Round	9 1/2" x 11 1/2"	\$3.47
12 1/2" Round	11 1/2" x 13 1/2"	4.78
14" Rect.	11 1/2" x 14"	4.52
16" Round	13 1/2" x 16 1/2"	5.97
16" Rect.	12 3/4" x 16 1/2"	5.84
17" Rect.	13 9/16" x 16 1/2"	5.97
19" Round	15 1/2" x 19 1/2"	7.69
20" Rect.	15 3/4" x 19 1/2"	7.98
24" Round	20 1/2" x 26 1/2"	14.65
(Including Set of Rosettes)		

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plus Parts, Phonograph Rec-  
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Improves Contrast, Sharpens Picture Image

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10" -----	8"x10 1/2"	\$ .89
12 1/2" ---	9"x12 1/2"	1.26
14" -----	10 1/2"x15"	1.47
16" -----	12"x16 3/8"	1.92
17" -----	13 3/8"x17 3/8"	2.16
19" or 20"	15 1/2"x19 1/2"	2.44

SIZES TO FIT ALL SETS IN SMOKE OR BLUE COLORS

## CUSTOM-BUILT AUTO RADIOS

Known Manufacturer . . . Licensed by RCA  
4-TUBE SUPER (8-Tube Performance) Installs easily  
in 15 minutes. Appearance and tone quality equal  
to expensive radios supplied by car manufacturers.

FORD . . . 1949-50-51 PLYMOUTH . 1949-50-51

DODGE . . . 49-50 CHEVROLET . 49-50-51

STUDEBAKER 50-51 HUDSON . 48-49-50-51

HENRY J. . . . . 51 All List at \$59.95

YOUR PRICE . . . . . (Any Model)  
COMPLETE, READY TO INSTALL.  
INCLUDING EASY INSTRUCTIONS **\$41.97** NET

## WE PAY TOP DOLLAR \$

for all types of  
SURPLUS ELECTRONIC EQUIPT. \$

Regardless of Condition. Ready Cash for: \$

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- DY-17 Dynamiter
- TS-12 Test Sets
- TS-13 Test Sets
- MN-26 J or K
- BC-342
- BC-312
- BC-611 Handie Talkie (or any part)
- 1-100 Test Sets
- BC-348 Rev.
- BC-788A, AM, B or C
- 1-152A, AM, B or C
- ARC-1
- ARC-3
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- Any Test Equipment
- TS-67

Plus anything you have in Electronics Equipment.  
Send your complete list, present condition and  
asking price to: \$

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Dept. V-4 \$

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				100% Guaranteed	
1B3 . . . 80.94	6AG5 . . . 81.09	630 . . . 81.24	12AT7 \$1.29		
6U4 . . . . 59	6BD6 . . . 1.49	6TR . . . 1.19	957 . . . . 2		
6AL5 . . . 49	6BQ6 . . . 1.29	6W4 . . . . 89	AA kit \$1.19		
6AD6 . . . 68	6CD6 . . . 2.19	12AU7 . . . 89	Free List		
25% Dep. Bal. C.O.D.					
F.O.B., New York City					
Sell Your Tubes • Make \$\$\$					

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IS PROUD TO ANNOUNCE A PRECISION ENGINEERED

# COLOR

ADAPTER FOR ALL TV SETS NOW AVAILABLE.



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After two years of unending research, COLORTONE TELEVISION CO., INC., now brings you this precision engineered, low cost Color Adapter for all popular TV set models! For both electronic and mechanical color systems.

ATTENTION DEALERS: Be prepared to meet the unprecedented nation-wide demand for color television! Make no mistake about it—COLOR TV IS HERE TO STAY!

**CALL, WRITE OR WIRE TODAY FOR COMPLETE DETAILS ON HOW YOU CAN BECOME FIRST IN YOUR AREA TO CONVERT TO BLACK & WHITE TV TO COLOR! FRANCHISE TERRITORIES OPEN—WRITE FOR PARTICULARS.**

Synchronization units and color wheels (official CBS specifications) available

### Colortone Television Co., Inc.

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## Television -Radio OR Electricity



**TRAIN QUICKLY!**  
**OLDEST, BEST EQUIPPED**  
**SCHOOL of ITS KIND in U.S.**  
*Young and Older Men*

Come to the Great Shops of Coyne in Chicago. Get practical training in TELEVISION-RADIO or ELECTRICITY—vital in Defense Program. Prepare now for a better job or better service rating.

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**OBLONG openings**  
**in radio chassis**



WITH THE GREENLEE No. 731  
SQUARE RADIO CHASSIS PUNCH

Now, in 1½ minutes or less you can do hole-cutting jobs that might take an hour with old "drilling and filing" methods. Simply insert GREENLEE Punch and turn with an ordinary wrench... a square or oblong opening is cut immediately. An indispensable, timesaving tool that pays for itself in a hurry.



In sizes ½", ¾" and 1"



Write today for facts and prices on this handy Punch.  
Greenlee Tool Co., 1888 Columbia Ave., Rockford, Ill.

## WANTED

YOUR SPARE SURPLUS EQUIPMENT  
DYNAMOTORS • SELSYNS • AUTOSYNS • INVERTERS  
TRANSMITTERS • RECEIVERS • TEST EQUIPMENT  
Please send list stating condition and lowest price  
No Quantity Too Small or Too Large!

**C & H SALES COMPANY**

Box 354-SR East Pasadena Station

Pasadena 8, California

## Technical BOOKS

**"F-M SIMPLIFIED"** by Milton S. Kiver. Published by D. Van Nostrand Company, Inc., New York. 453 pages. Price \$6.50. Second Edition.

This second edition of Milton Kiver's popular handbook on frequency modulation has been rearranged, rewritten, and brought up-to-date to conform with the developments that have taken place in the field since the first edition appeared in 1947.

This new text contains complete information on the construction and operation of FM receivers and transmitters and their accessory units, the operation, installation, and servicing of all present-day FM equipment, and a detailed troubleshooting procedure for locating service faults in the power supply, audio amplifier, FM detector or discriminator, the i.f. system, and the r.f. section of the receiver.

Like the first edition, this new volume is designed as a self-study text and has, therefore, been written with some thought being given to the difficulties likely to be encountered by the student. There are test questions at the end of each chapter by means of which the tyro can check his grasp of the subject matter. This new edition contains more and more detailed diagrams than the previous edition, a feature which is of inestimable assistance to the student.

Three chapters have been devoted to a discussion of FM transmitters as manufactured by commercial suppliers of these units. These chapters, which classify the transmitters according to the method by which the FM signals are generated, are of particular value to persons planning to set up FM station facilities.

Like Mr. Kiver's other books on the subject of FM and television, this text is recommended for the beginner since it is a clearcut explanation of the subject written in easy-to-understand language.

**"PRACTICAL WIRELESS ENCYCLOPAEDIA"** by F. J. Camm. Published by George Neumes, Limited, London. 360 pages. Price 21/-. Twelfth Edition.

This most recent edition of a standard reference work in the radio field contains new sections covering radar, television, remote control, oscillators, Kirchhoff's laws, photoelectric cells, a new series of circuits for receivers and amplifiers, automatic station selection, auto radios, electron multipliers, quartz crystals, amateur transmission, troubleshooting, building a television receiver, the new color codes, antennas, meters, a listing of short-wave stations, tubes, and a list of approved service terms.

The material is presented in alphabetical order which facilitates locating the desired subject. Although the

**RADIO & TELEVISION NEWS**

## KITS! KITS! KITS!

Popular Brands! Clean stocks!  
100—Carbon Resistors 1/2 & 1 W.  
100—Paper Tubular Cond.  
100—Mica Condensers  
100—Ceramic Condensers  
100—Ass't. Term. Strips  
50—Oil Filled Bathub Condensers  
20—Filter Condensers  
25—W. W. Resistors 5-100 W.

**\$3.95**

**Assorted Parts Package**  
Approximate 15 pounds. **\$1.49**

• **F. M. TRANSMITTER—BC-604 W.E.**  
Freq. 20 Mc. to 27.9 Mc. USED, good condition.  
Less crystals, tubes and dyn. **\$9.95**

• **CRYSTAL KIT—BC-604**  
80 units .1 Mc. apart. In convenient case. **\$22.50**

• **MOBILE POWER PACK PE-125 BX**  
Input: 12 or 24 volts D. C. @ 15 or 7.5 amps.  
Output: 475 V. D. C. @ 200 Ma. Ideal for mobile,  
marine or aircraft installations. Brand new with  
tubes and manual. **\$32.95**

**POWER TRANSFORMERS**  
**LEADING MFR. BRAND NEW**

P-1367 700 V.Ct. @ 90 Ma. 5 V. 3 A. 2.5 V.Ct.  
12.5 A. **\$4.50**

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P-1353 700 V.Ct. @ 120 Ma. 5 V. 3 A. 6.3 V.Ct.  
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GL-856. Prim. 115/230 V. Sec. 4.5 to 34 V. In 4 V.  
steps at 2 amps. Cased. NEW **\$2.95**

W.E.-T1071. 115/230 50-60 cyc. Delivers 11.5 V.  
@ 8 amps or 25 V. @ 4 amps. 100 V. A. prim.  
Completely shielded. NEW **\$3.95 ea.**

**MODULATION TRANSFORMER A-19772**  
1.575:1 ratio (Ct.) Prim. Z=5700 ohms 150 Ma. D.C.  
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permallyoy core material. Standoff terminals.  
Size: 3 1/2" x 8" x 3 1/2" x 2 1/2" D. Ideal for 50-75  
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• **RECORD CHANGERS**  
Single speed (78 RPM) Popular mfr. Size: 8 1/4" H. x  
13" W. x 11 1/4" D. Complete with mtg. hdwe. and  
instruction. BRAND NEW **\$12.95**

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subject to change without notice.

• **Railway Express only.**

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**REK-O-KUT presents a New**

**Continuously Variable-Speed  
Turntable of Broadcast Quality**



**Plays at any  
speed from 25  
to 100 R. P. M.,  
without "wow!"**

**Speed can be varied  
while in operation to produce  
sound effects.**

Now for the first time... a continuously variable  
turntable of Broadcast Quality at a popular price.  
Ideal for record collectors, musicians, singers, disc  
jockeys, broadcast stations, music schools, dance  
studios, skating rinks, gymnasiums, etc. Plays through  
amplifier, radio, TV set or phonograph. Operates on  
50 or 60 cycles.

**Model CV5-12 (illustrated)**  
Chassis, motor and turntable **\$84.95 net.**

**Model CV5-12P, mounted in portable case**  
with 16" dual stylus pickup. **\$124.95, net.**

\*\*\*\*\*

**3-Speed 12" Transcription Turntable**

Recommended by outstanding music critics. Induc-  
tion-type motor designed for smooth, quiet, vibra-  
tion-free operation. 3 speeds, 78, 45 and 33 1/3.

**Model LP-743** **\$54.95 net.**

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Write for Illustrated Catalog of REK-O-KUT Line  
of Hi-Fidelity Recording Instruments, Phono-  
graphs, Transcription Tables, Accessories.

**REK-O-KUT CO.**

38-05 QUEENS BLVD., LONG ISLAND 1, N. Y.

August, 1951

terminology is British, users on this  
side of the Atlantic should experience  
little difficulty in making the "trans-  
lation" to the more familiar American  
terms.

\*\*\*  
"UHF TELEVISION AND VHF-  
UHF TUNERS" by Edward M. Noll.  
Published by Paul H. Wendel Publish-  
ing Company, Inc., Indianapolis. 52  
pages. Price \$1.00. Paper bound.

This is another of the "Notebooks"  
being issued by the Television Tech-  
nicians Lecture Bureau for the benefit  
of service technicians working in the  
television field.

This "Notebook" is divided into two  
main sections covering v.h.f. tuners  
and u.h.f. television. The first section  
deals with such subjects as the func-  
tion of the TV tuner; gain, sensitivity,  
and bandwidth; signal-to-noise ratio;  
interference; the alignment curve and  
its significance; typical commercial  
tuners; alignment; alignment pro-  
cedures; tuner replacements; fringe  
area alignment; tuner troubles; and  
manufacturers' service notes.

The second section covers propaga-  
tion at u.h.f.; influence of weather;  
polycasting; the RCA u.h.f. field ex-  
periment; u.h.f. converter methods; an-  
tennas at u.h.f.; u.h.f. converter cir-  
cuits; RCA's experimental tuners; the  
v.h.f. and u.h.f. television spectrum  
utilization; and proposed channel al-  
locations for v.h.f. and u.h.f. television.

This handbook is a thoroughly prac-  
tical presentation of the subject and  
the text material is well-illustrated  
with circuit diagrams and line draw-  
ings.

\*\*\*  
"MOST-OFTEN-NEEDED 1951  
TELEVISION SERVICING INFOR-  
MATION" compiled by M. N. Beit-  
man. Published by Supreme Publica-  
tions, Chicago. 192 pages. Price \$3.00.

This newest service manual in the  
Supreme series covers television re-  
ceivers produced by twenty-seven of  
the leading video manufacturers.

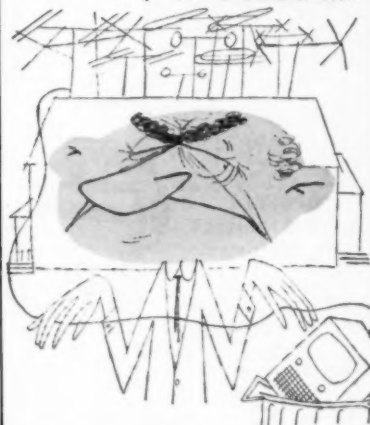
As with the previous issues, the new  
manual provides a parts location dia-  
gram, a schematic, alignment mat-  
erial, special service hints, and oscillo-  
grams on each of the receivers cov-  
ered. The material is presented in  
concise and often tabular form to  
speed service and eliminate time-con-  
suming perusal of the text.

Since many of the 1951 model tele-  
vision receivers currently on the mar-  
ket incorporate substitute materials  
for scarce metals, somewhat different  
servicing and replacement procedures  
apply in handling these sets.

Like the other manuals in this se-  
ries, this latest volume is printed on  
large sheets in clear, easily-readable  
type to permit the user to place the  
book out of the way of the set being  
serviced yet allow it to be referred to  
without strain.

Technicians who service a heavy vol-  
ume of television receivers will find  
this compact manual of assistance in  
speeding their repair and maintenance  
jobs.

**\*%!\* Hundreds of  
dollars for antennas  
and I lost all the  
signal in the  
\$\*!%! lead-in!**



Don't nullify the advantages of cost-  
ly antenna-receiver installations by  
loss of signal in the line. Specify the  
lead-in that's acclaimed everywhere;  
the line that guarantees lowest loss  
... holds the signal stronger on  
short or long runs (1/2 mile to mile  
with minimum loss) ... resists  
disastrous atmospheric conditions  
indefinitely!

Next time play safe with Permanent

**OPEN LINE**  
and be assured of only  
**1/6 the LOSS**

**NOW AT A  
NEW LOW  
PRICE:**

Since its intro-  
duction, Open  
Line has taken  
the country by  
storm! Now, as  
the nation's low-  
est loss Open  
Line TV Wire,  
the tremendously  
increased produc-  
tion and demand  
has enabled us to  
reduce the list  
price substantial-  
ly. Ask your rep  
to give you the  
good news!



Through Your Distributor—or Write

**T. V. WIRE PRODUCTS**

THE PERFECT FINAL TOUCH  
TO QUALITY INSTALLATIONS

Now in Our New Home:  
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ROckwell 9-2562



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... in FT 241-A Holders-  
16 Pin SPC. Marked in 54th  
OR 72nd Harmonic MC Freq.  
Listed below by fundamental  
frequency with fractions omit-  
ted.

412 433 472 492	390 402	372 381	450 530
413 434 473 493	391 403	374 383	452 531
414 435 474 494	392 404	375 384	461 533
415 436 475 495	393 405	376 386	465 537
416 438 479 503	394 408	377 387	526 538
418 440 481 504	395 409	379 388	
419 441 483 506	396 411	389	
420 442 485 509	401		
422 443 487 511			
423 444 488 516			
424 446 490 518			
425 447 491 519			
426 448			
427 462			
431 468			

99c  
Each  
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79c  
Each  
Postpaid

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Each  
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Complete Contact Mike As-  
sembly includes: Two micro-  
phones, on-off switch, am-  
plifying transformer, batteries,  
battery case. Connector to at-  
tach to any radio, AC, DC or  
battery portable. Amplification up to full volume out-  
put of radio or sound system used. FB for  
watch or clock repair. Diesel engine in-  
jector adjustment, gas engine diagnosis.  
etc. Specially Priced at... **\$3.95**  
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### BLACK LIGHT KITS

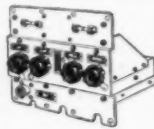
#### ULTRA-VIOLET FLUORESCENCE

NOW... build your own  
black light equipment at  
a new low cost with these  
easy-to-assemble com-  
ponents. Kit contains:  
Ultra-violet tube, wire,  
plug and diagrams.

4-Watt Kit—(5 1/2" tube)	\$3.00 p.p.d.
8-Watt Kit—(12" tube)	\$4.00 p.p.d.

### TUNER FROM NAVY "BN" EQUIPMENT

Simply modified into 2-me-  
ter converter for car or  
communications receiver.  
Uses 1-446, 1-6N17, 1-  
6006, 1-6J5 (Not Fur-  
nished).  
Plug is tuned from 157 to 187 Megacycles.  
Includes schematic diagram for "BN"  
equipment.  
A Real Value... **\$6.95**  
ONLY



### POWER TRANSFORMER

Primary 125 volts tapped at 105 and  
115 volts, 50 to 425 cycles. Second-  
aries: 5.1 v. at 3.0 amps. 325-0-325  
v. at 0.175 amp., 5.4 v. at 8 amp., 6.4  
v. at 10.3 amp., 2.5 v. at 3.0 amp.,  
4500 v. at .005 amp., 2.5 v. and 4500  
volt windings insulated for 6000 volts.  
All other windings insulated for 1500  
volts. Cost government more  
than \$42.00—a real bargain! **\$4.95**

### METERS, AIRCRAFT

1-Milliamper, zero center FB  
for field strength meters, grid  
dip or tuning meters.

BRAND NEW... **\$1.95**  
Postpaid

ALL EQUIPMENT F.O.B. PASADENA UNLESS  
OTHERWISE SPECIFIED. PLEASE ENCLOSE  
FULL AMOUNT WITH ORDER

## C & H SALES CO.

BOX 356-TN East Pasadena Station, Pasadena 8, Calif.

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### PREPARE FOR A GOOD JOB!

BROADCAST ENGINEER  
COMMERCIAL OPERATOR (CODE)  
RADIO SERVICEMAN

### Television Servicing

(Approved for Veterans)  
SEND FOR FREE LITERATURE  
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1425 EUTAW PLACE, BALT. 17, MD.

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AUGUST  
1951

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